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AUDITING ANALYSES OF TECHNOLOGICAL CHANGE

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THESIS

AUDITING ANALYSES OF

TECHNOLOGICAL CHANGE

by

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Auditing Analyses of

Technological Change

by

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ABSTRACT

The objective of this study was to investigate a proposed method of auditing cost-effectiveness analyses of technological changes. The method is based on the use of cost functions to predict costs of operating with and without the improved technology. A comparison of these predicted costs indicates whether the technological change is cost-effective. Results of the comparison can then be used to audit more detailed analyses of the change. The investigation employed econometric techniques in a case study application of the method to a technological change which occurred at the Naval Air Rework Facility, North Island, San Diego, California.

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I. INTRODUCTION

A. DEFINITION OF THE PROBLEM

It is commonly accepted that technological advancements are arriving at a faster and faster pace with the state of the art generally far ahead of the functional application. One reason for this gap is the costly enterprise of transferring theory into practice. When the initial transfer is made a natural question to ask prior to extensive implementation is "Will it be cost-effective?" Current methods of cost-effectiveness analysis are tedious and usually employ a detailed analysis of the process which incorporated the change. Such analyses are inherently imprecise due to the possibilities of overlooked dependencies, double counting of costs, and external changes which may affect the effectiveness of the process and yet not be accounted for in the analysis. Thus when a cost-effectiveness analysis is completed a reviewing agency might well ask, "Are the conclusions of the analysis correct?" As mentioned, the methods employed in the analysis make this second question a hard one to answer.

This study is solely concerned with investigating a method which may simplify the task of answering the second question; that is, a method for auditing cost-effectiveness

analyses of technological changes. The investigation was accomplished by applying the method to a specific technological change which occurred at the Naval Air Rework Facility at North Island, California (NARFNI). While an indirect product of this study is a statement concerning the cost-effectiveness of the change which occurred at NARFNI, it is emphasized that the purpose of the study is to investigate and refine an auditing method initially proposed by Robert L. Spooner [Ref. 4], which was based on the estimation of production functions through linear least-squares regression techniques. A description of Spooner's proposal and later refinements established by Charles W. Bradley [Ref. 1] and Wilber C. Trafton [Ref. 6] will be given in Chapter II.

B. NARFNI

NARFNI is one of seven naval air rework facilities throughout the continental United States responsible for major maintenance, conversion and repair of United States Navy and Marine Corps aircraft and related components. To accomplish this mission NARFNI employes approximately 6800 civilian workers and spends $150 million on annual operating expenses [Bradley, pp. 8 and 12].

Maintenance of equipment is accomplished under one of three primary programs, with two of the programs receiving inputs either directly from the customer or from the third program (see Fig. 1).

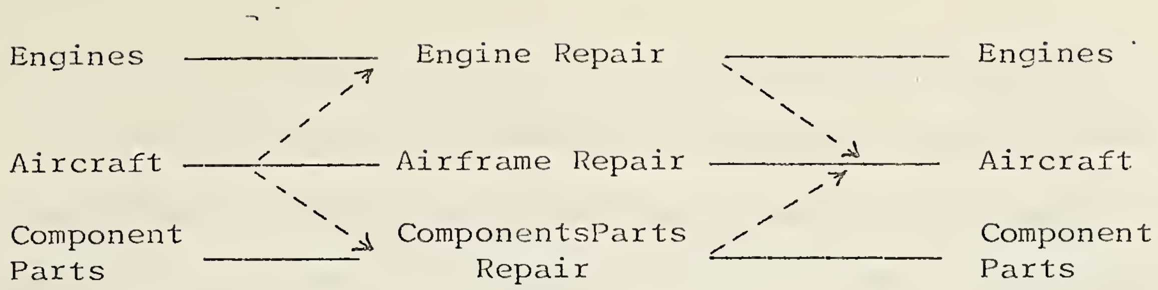

FIGURE 1. NARFNI Repair Programs

Under these programs work is further assigned to one of the six divisions of the Production Department identified in Figure 2.

Weapons #1
Weapons #2
Hydrolic/Mechanical
Power Plant
Avionics
Components and Metal

FIGURE 2. Production Department Divisions

The assignment of work to various programs and production divisions can be thought of as a "job shop" operation in which each shop performs a specific task. Thus an item entering rework is subject to being dismantled, its subassemblies distributed for rework, and then reassembled prior to returning to the customer. This type of operation places emphasis on the scheduling of rework in that ideally the shops are completing work on related parts in the same sequence to reduce the total repair time of the major end items.

Scheduling is also important to the shop managers who must order material and plan personnel assignments based on the projected arrival of work from other shops. This entire scheduling problem is intimately related to the technological change to be described in the following section.

NARFNI is primarily funded by the Navy Industrial Fund (NIF) which provides a working capital fund to finance repair operations. The finished product is returned with a bill to the customer for the work done. This "debt" is then paid by transfering funds from the customer's appropriated maintenance funds to the NARF's working capital fund. Under this concept NARFNI is required to control its finances to incur zero profit at the end of each fiscal year. This control is exercised at Quarterly Planning Conferences in which representatives from the customers and NARFNI meet to plan the following quarter's work load input and prices for the work to be accomplished.

The work load is measured in number of required man hours (NORM) of direct labor needed to accomplish the work requested by the customers. The NORM is estimated from historical data maintained by NARFNI on each type of work it has accomplished in the past.

NARFNI is reimbursed under basically two types of contracts, cost reimbursable and fixed price, the majority of

the work being performed under fixed price contracts established at the Quarterly Planning Conference. This type of contract gives NARFNI incentive to minimize costs subject to the required work load, a fact which is instrumental to the auditing method investigated.

C. WORK IN PROCESS INVENTORY CONTROL SYSTEM (WIPICS)

In January, 1972, NARFNI installed an industrial information system to assist in the location and scheduling of inventory in the rework process. WIPICS was requested and initiated by the Management Systems Development Office (MSDO) in an effort to assist the NARF's in performing their mission at a minimum cost to the government. If the prototype at NARFNI is determined to be cost-effective WIPICS will then be installed at the remaining six NARF's. Its major milestone are listed in Figure 3.

1. Early 1969 - ROHR Corporation studied NARFNI
2. Late 1969 - MSDO requested contract
3. Early 1970 - NAVAIRSYSCOM evaluation and approval
4. July 1970 - SECNAV authority for prototype
5. Late 1970 - Contract negotiated
6. 4 January 1971 - Contract date, D-Day
7. D + 9.5 months - WIPICS developed
8. D + 11 months - WIPICS test
9. D + 11.5 months - WIPICS prototype started

FIGURE 3. WIPICS Milestones

WIPICS consists of a central computer which is linked to the job shops by 164 "touch tone" telephones, 20 alpha-numeric terminals, and four teletypewriters. In addition, the system is equipped with an 80 word audio-response unit to allow two-way communication through the telephones. When an item first arrives at NARFNI it is broken down into identifiable subassemblies. For each of these subassemblies a computer record is created and entered into WIPICS. This record contains information such as identification, required work, required material, location, and status. Each job shop inputs arrival and departure information through the "touch-tone" telephones. Also, an unexpected delay in work due to lack of material or some other shortcoming is inputed as it occurs. At the completion of the work day a print-out of this information is produced to aid shop managers in projecting the rate and mix of work that will be entering their respective shops in the near future.

The inauguration of the WIPICS prototype was accomplished by creating computer records for all jobs presently in the shop to preclude a lengthy start up before evaluation could begin. Simultaneously, the operational costs accountable to WIPICS were transfered as overhead to be applied to the price of jobs in shop. Thus, during January, 1972, NARFNI initiated a technological change which was to be subjected to

cost-effectiveness analysis and, at the same time, provided a suitable situation to use in investigating a method for auditing cost-effectiveness analyses.

D. SCOPE OF STUDY

Previous work conducted by Spooner, Bradley, and Trafton was directed at completing a methodology for determining if NARFNI is operating more efficiently after installation of the WIPICS prototype. However, the method is relatively new itself and numerous problems prevented completion of the effort. One major problem was the lack of production data after the incorporation of WIPICS. The purpose of this study is to complete that work. The remaining portions of the study are divided into the following catagories:

1. Discussion of the methodology and production data available from NARFNI.

2. Preliminary estimation of NARF costs as functions of the work load and prices of inputs, and analysis of the characteristics of these functions.

3. Estimation and analysis of before and after WIPICS cost functions followed by a direct comparison of the two cost situations.

4. Discussion of the exogeneous variables which were not included in the estimation of the cost functions.

5. Conclusions.

II. METHODOLOGY AND DATA

A. GENERAL

The instructional objective is to determine the effectiveness of WIPICS. The major difficulty in attaining this objective is the probable abundance of other changes which make the before and after WIPICS situations different. Thus, a direct comparison of costs is invalid. The ideal solution would be to operate two "identical" NARF's, one with and one without WIPICS, and then compare costs. While this solution is unobtainable an estimation of its outcome is not. The costs of those two NARFs can be estimated through the use of econometric techniques to construct before and after WIPICS cost functions. The estimation methods were reported by Trafton but are outlined in Sections B, C, and D for reference.

In order to estimate the cost functions their structure must first be specified by solving a mathematical program in which NARFNI is assumed to be minimizing costs subject to a production function,

$$\begin{aligned} &\text{minimize} \quad C = P_1X_1 t \ldots P_nX_n \\ &\text{subject to} \quad Y = F(X_1, ..X_n). \end{aligned} \tag{1}$$

As stated in Chapter I, NARFNI has three major programs, each producing many different outputs. For example, the airframe program produces airframe repairs on 20 quite

different aircraft, and the engine program has an even more varied output. To obtain a more tractable situation the problem at (1) was solved and then applied to the major NARFNI programs separately. The result is one cost function for the airframe program and one for the engine program. Before describing the form of the cost functions a description of the data available and the types of production functions assumed to hold is necessary.

B. NARFNI PRODUCTION DATA

The data was obtained from NARFNI's Production Performance Report, a quarterly report which details the total resources expended on each airframe and engine which has completed its repair process. The report does not include detailed information on the component parts program but rather a monthly summary of total resources expended in that program. A description of the data for airframes and engines is given below.

1. Identification - includes the type of aircraft or engine and the extent of work required, such as overhaul, repair of crash damage, modification, or conversion. The type of work required affects the NORM assigned to the item.

2. NORM - is NARFNI's estimate of the direct labor hours required to accomplish the work. NORM is established

at the Quarterly Planning Conference before induction of the item.

3. Induction and completion date - are the Julian dates the item actually entered rework and then work completed.

4. Direct labor hours (L) - is the total labor hours that can be specifically identified with rework of the item.

5. Direct labor dollars (L$) - is the total cost of the direct labor expended on the item.

6. Material dollars (M$) - is the total cost of materials that can be specifically identified with rework of the item.

7. Overhead dollars (O$) - is a prorated portion of those NARFNI costs which cannot be identified with specific items in rework.

The data taken from the Production Performance Reports are raw in the sense that they represent actual costs per item. Bradley wrote a computer program which prorates the NORM, DLH, DL$, M, O for each item over the number of days the item was in shop. The program then aggregates the prorated data to obtain daily totals for the engine and airframe programs for the period under study. Bradley's program generates one additional variable, the number of items in rework (I) on each day. Trafton modified these programs

to include a penalty cost (P$) chargeable to each item for every day it was in the NARF [6, p. 22]. This was an effort to reflect pipeline costs which may be the costs most significantly altered by WIPICS. These penalty costs are especially significant in the component parts program. A relatively small part, such as a generator, may be the prime reason an F-4 aircraft is non-operational at its home base. Unfortunately, lack of data in the component parts program prevented inclusion of that program in this thesis.

Two variables were constructed from the aggregated data.

$PL = \frac{L\$}{L}$, which is a rough surrogate for the price of labor, and

$PI = \frac{P\$}{L}$, which is an average penalty cost per item on a given day.

Notice that PL will vary with changes in the amount of overtime employed as well as a general pay raise. It may also vary as the distribution of jobs in the work load changes from one level of skill to another.

C. PRODUCTION FUNCTIONS

Two structures for the production function in the economic problem of Section A were used, the Cobb-Douglas and the Constant Elasticity of Substitution (CES) production functions. This was done to compare the ability of each to model the relationship between NARFNI's inputs and outputs. In each program the output is approximated by NORM produced

each day. This approximation is necessary due to the numerous types of airframes and engines being repaired. Since NORM is measured in the same units for every item it is a simple way of measuring production while at the same time reflecting the amount of work accomplished by NARFNI each day.

The Cobb-Douglas production function was assumed to have three inputs:

1. L with price PL
2. I with price PI
3. M with price 1 (since material is measured in dollars).

Thus the production function takes on the form

$$\ln N = \alpha_0 + \alpha_1 \ln L + \alpha_2 \ln I + \alpha_3 \ln M. \tag{2}$$

The CES production function was assumed to have two inputs, L and I, and takes the form

$$N = \gamma\left[\delta I^{-\rho} + (1-\delta) L^{-\rho}\right]^{-\sigma/\rho}$$

$$\text{or} \quad \ln N = \ln\gamma + \frac{-\sigma}{\rho} \ln\left[\delta I^{-\rho} + (1-\delta) L^{-\rho}\right] \tag{3}$$

The Cobb-Douglas production function was selected for its useful and convenient application in emperial work. It is a special case of the CES function in that the limit of the CES production function, as $\rho \to 0$, is the Cobb-Douglas function. Therefore, the elasticity of substitution (σ) of inputs is assumed fixed at one in the Cobb-Douglas function and it is only assumed to be a constant in the CES function [2, p. 327].

The CES production function was included in the study specifically because it allows to differ from unity and therefore, should present a more accurate model of NARFNI's production relation should this be the case. This advantage is offset, however, by the fact that the CES function at (3) above is not linear in the parameters and estimation of the resulting cost function becomes more difficult.

D. ESTIMATING THE COST FUNCTIONS

The following procedures apply to both the airframe and engine cost function estimation. For this reason only the airframe procedures are presented.

1. Cobb-Douglas Cost Function

The cost function is derived by solving

$$\min C = PL(L) + M + PI(I)$$

$$\text{st. } N = AL^{\alpha} I^{\beta} M^{\gamma}$$ [see 6, p. 32]

where the dependent variable in the objective function is defined as DL\$ + M + P. The Lagrangian (LG) is

$$LG = PL(L) + M + PI(I) - \lambda(N - AL^{\alpha} I^{\beta} M^{\gamma}). \quad (4)$$

The 1st order conditions are obtained by taking partial derivatives of (4) with respect to L, M, I, and . The results are:

$$LG_l = PL + \lambda\alpha AL^{\alpha-1} I^{\beta} M^{\gamma} / \mu_l \quad (5)$$

$$LG_m = 1 + \lambda\gamma AL^{\alpha} I^{\beta} M^{\gamma-1} / \mu_m \quad (6)$$

$$LG_i = PI + \lambda\beta AL^{\alpha} I^{\beta-1} M^{\gamma} / \mu_i \quad (7)$$

$$LG_{\lambda} = N - AL^{\alpha} I^{\beta} M^{\gamma} e^{\mu} \qquad (8)$$

where the 's are random variables associated with errors due to imperfect cost minimization by NARFNI.

These 1st order conditions can be solved to obtain the inputs as functions of the prices and output. Substitution of these functions into the logarithmic form of the cost function yields

$$\ln C = a + \frac{1}{\alpha+\beta+\gamma} \ln N + \frac{\alpha}{\alpha+\beta+\gamma} \ln PL + \frac{\beta}{\alpha+\beta+\gamma} \ln PI + \epsilon \qquad (9)$$

where the error term (ϵ) is assumed to be normally distributed with mean zero and constant variance.

Standard linear least-squares regression techniques [5, Chap. 3] were used to estimate the coefficients of the variables in (9). The results are reported in Chapters III and IV.

2. Constant Elasticity of Substitution Cost Function

Again, the cost function is obtained by solving

$$\min C = PI(I) + PL(L)$$

$$\text{st } N = \gamma\left[\delta L^{-\rho} + (1-\delta)\, I^{-\rho}\right]^{-\sigma/\rho}$$

where C is now defined as DL\$ + O + P. The resulting function is

$$\ln C = \alpha + \ln\left[PL + PI(I/L)\right] + \beta \ln N + \omega D + \epsilon \qquad (10)$$

in which

$$\alpha = -\frac{1}{\sigma} \ln \gamma$$

$$\beta = \frac{1}{\sigma} \qquad (11)$$

$$\omega = \frac{1}{\rho}$$

$$D = \ln\left[(1-\delta) + \delta\left(\frac{I}{L}\right)^{-\rho}\right]$$

The equation at (10) is not linear in the original parameters of the production function and, therefore, cannot be estimated by the same procedures used on the Cobb-Douglas cost function. A more complex two-stage least-squares regression technique was used instead. The first stage consists of a linear least-squares estimation of

$$\ln\left({}^{I}/L\right) = a + b\ \ln\left({}^{PI}/PL\right) + \epsilon \qquad (12)$$

where

$$a = \left(\frac{1-\delta}{\delta}\right)^{-\frac{1}{\rho-1}} \quad \text{and } b = -\frac{1}{\rho-1} \quad .$$

Equation (12) is derived from the first order conditions of the mathematical program [see Trafton, p. 18]. The resulting estimate of $({}^{I}/L)$ is then substituted into D at (11). The estimate of D is then substituted into (10) which becomes linear in the parameters. Thus, the second stage consists of a linear least-squares regression to estimate the coefficients of (10).

A comparison of the Cobb-Douglas and CES cost functions derived is discussed in Chapter III where a preliminary analysis of the procedure is reported prior to application of the entire auditing methodology.

E. DIRECT COMPARISON OF THE COST FUNCTIONS

To estimate the effect of WIPICS on NARFNI's efficiency the cost functions derived in Section D were estimated using aggregated production data from a period of time prior to the inauguration of WIPICS to obtain before-WIPICS engine and airframe cost functions. The procedure was then repeated using aggregated production data for a period after WIPICS for an after-WIPICS cost function for each program (Fig. 4).

	Before WIPICS	After WIPICS
Airframes	CD cost function CES cost function	CD cost function CES cost function
Engines	CD cost function CES cost function	CD cost function CES cost function

FIGURE 4. Cost Functions Estimated

To compare the two situations the before and after data were consolidated and used in the before and after cost functions to estimate daily program costs for a given period. By averaging the difference between the expected cost with WIPICS and the expected cost without WIPICS a mean cost differential is predicted for each of the following situations:

1. NARFNI operation with and without WIPICS using before WIPICS observations.

2. NARFNI operation with and without WIPICS using after WIPICS observations.

This procedure is followed for both the Cobb-Douglas and CES functions. The computer program constructed for this purpose is listed at Appendix A.

F. DATA

Production data was obtained on the engine program for two separate periods. The first period covered 1865 engines inducted on Julian dates 0140 through 1273. The aggregated results obtained from this period is listed in Appendix B of Bradley's thesis. The second period covered 521 engines inducted on 2003 through 3050 with the aggregated results listed at Appendix B of this thesis. Data on the airframe program covered 564 airframes inducted on 0069 through 2234. The aggregated results from Julian date 1001 forward are listed in Appendix C.

The operational cost of WIPICS chargeable to NARFNI averages approximately $48,000 per month or $1600 per day. NARFNI was not held accountable for these charges until January, 1973.

III. PRELIMINARY ANALYSIS

Before attempting to apply the procedures outlined in Chapter II a preliminary analysis was performed to develop methods of characterizing the estimation techniques. This was accomplished by using a 400 day period of data to estimate cost functions and test for stability and accuracy. The resulting proceedures were then included in the final analysis of the technological change. The 400 day period used in this chapter was well before the WIPICS prototype became operational. Therefore, the results obtained should reveal some of the problems to look for in the estimation of the cost functions, that is, the expected variability of the cost function due to events other than the implementation of WIPICS.

A. REGRESSION RESULTS

Using the procedures outlined in Chapter II Cobb-Douglas and CES cost functions were estimated from 300 days of aggregated production data. The resulting coefficients are presented in Table I. The results of the first stage of the estimation procedure for the CES cost function is not presented unless the coefficients are not significantly different from zero. R^2, when multiplied by 100, is the percentage of total variation in cost that can be explained by the estimated

function. SE is the standard error of the estimated cost function (in logarithmic form), and the number in parenthesis is the standard error of the coefficient just above it. Standard errors for leading coefficients are not computed.

	Function Coefficients	SE	R^2
Airframes[1]	CD: .624 .760 2.754 -.267 (.015) (.066) (.036)	.021	.956
	CES: .2175 0.870 -.2.461 (.007) (.182)	.011	.980
Engines[2]	CD: 3.046 .877 .401 .032 (.017) (.095) (.052)	.035	.907
	CES: 2.506 .851 21.152 (.025) (6.113)	.053	.808

TABLE I. Before WIPICS Cost Functions (Preliminary)

---

[1] 300 observations from 0191 to 1226.

[2] 300 observations from 0215 to 1150

It should be noted that the dependent variable of the CES second stage regression is not lnC but rather

$$\ln \left[\frac{C}{PL + PI(^I/L)} \right].$$

Also, the C representing costs in the Cobb-Douglas function is the sum of material, penalty, and labor dollars, where as the C in the CES regression is overhead, penalty, and labor dollars. These two differences may explain why, in the air-frame program, the CES function has a higher R^2 than the Cobb-Douglas (indicating a better fit) while the Cobb-Douglas has a lower standard error (indicating it is more accurate). The two functions are thus not comparable in this form so different methods of comparison were needed.

A rough test for the significance of the coefficeints in Table I can be made by taking the ration of the coefficient to its standard error. If this ratio is less than two the coefficient is not significantly different from zero at approximately the 5% level of significance. All coefficients in Table I are significantly different from zero by this test and the conclusion can be made that each independent variable contributes to the explanation of the dependent variable.

B. STABILITY OF THE MODELS (CHOW TEST)

With the large fluxuation in work load and type at NARFNI (see NORM and penalty cost values in Appendices B and C) it is probable that the production and cost functions for NARFNI's programs shift considerably even though technology is in fact not changing. Inherent instability such as this may camouflage the shift due to technology and should, therefore, be tested for by means of the Chow Test /3, pp. 104-112/. The Chow Test is founded on the general principle that a regression line will not pass through every data point and that data obtained from two different populations can be better fit with a regression for each population than with a single regression for the total data set. If the converse of the above statement is assumed to hold, then a test to see if two sets of data are from the same population may be obtained by seeing if a single regression fits as well as two separate regressions on the respective data sets. To extend this test to the cost functions a second regression was performed on the 100 day periods following the 300 days in each of the two programs under study. The data was then combined and regressions run on the 400 day periods. The test statistic used was

$$F(k, n_4 - 2k) = \frac{n_4(SE_4) - n_3(SE_3) - n_1(SE_1)}{n_3(SE_3) + n_1(SE_1)} \cdot \frac{n_4 - 2k}{2k}$$

The subscripts refer to the respective data periods of 400, 300, and 100 days. SE is the resulting equation's standard error, n is the number of observations, and K is the number of coefficients estimated in each equation. If the test statistic is too large then the hypothesis that the two periods have the same cost function is rejected. Results are presented in Table II.

	Model	Test Statistic	Critical Value	Results
Airframes	CD	12.147	F(4,392) 2.43	Reject
	CES	28.78	F(5,390) 2.27	Reject
Engines	CD	14.741	F(4,392) 2.43	Reject
	CES	41.22	F(5,390) 2.27	Reject

TABLE II. Chow Test Results (Preliminary)

The entire 400 day periods used in the Chow Test fell well before WIPICS was operational at NARFNI indicating the cost functions are not stable, even with fixed technology. This revealed a possible problem in applying the auditing methodology proposed by Spooner. However, it may be possible to dimenish the importance of the instability if it is not too great. This can be done by increasing the sample size to well over 400 days, thereby allowing the variations in work

load to average out. This technique would prove ineffective against large, prolonged projects of a particular work type such as major modification of all F-4 aircraft in the Navy's inventory. In addition, this solution would mean waiting, perhaps for years, before obtaining enough data, after the technological change, to conduct the analysis. In most cases the requirement for the study would have long since been dropped.

A more generally acceptable solution would be to accept the cost function for use as long as it can accurately predict costs while at the same time keeping the accurracy in mind when final conclusions are drawn. This acceptance can only be justified if the accuracies of the function are measured.

C. ACCURACY OF THE COST FUNCTIONS

1. Empirical Confidence Intervals

If e_i is the error of the predicted cost for the i^{th} observation a confidence interval can be empirically constructed by using the ratio of two standard errors[3] of the function over the actual mean costs for the period. The result is a percent error in cost,

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[3] The term "standard error" is miss-used here since nothing is known about the distribution of the error terms. Still, the procedure is not uncommon.

$$\% \text{ error} = \frac{2\sqrt{\sum e_i^2/n}}{\sum C_i/n} \times 100.$$

The % error approximates $\pm$ 2 standard deviations which accounts for about 90% of the mass in most probability distributions. Thus, there is approximately a 90% confidence that the predicted cost is within the percent error computed of the actual cost.

This procedure was performed on the cost functions estimated from the 300 day period, and then on the 100 day period with costs being predicted by the 300 day models (Table III).

	Model	300 Observations	100 Observations
Airframes	CD	$\pm$ 04.0%	$\pm$ 05.0%
	CES	$\pm$ 02.3%	$\pm$ 03.1%
Engines	CD	$\pm$ 07.0%	$\pm$ 15.7%
	CES	$\pm$ 11.1%	$\pm$ 14.6%

TABLE III. % Errors in Cost Functions (Preliminary)

As the standard errors seemed to indicate in Table I, the CES cost function appears better for the airframe program while the results are mixed for the engine program. The largest errors are in the engine program when the functions were used to predict costs. This is understandable since the engine work load and mix of work fluctuate more rapidly and extremely than those of the airframe program. The results also indicate that the engine cost functions may be

highly sensitive to small shifts in the data period used. Finally, in the 300 day functions for engines, the Cobb-Douglas model appears to do a better job than the CES. This is counter to expected results and is not explained.

2. Statistical Prediction Intervals

A similar procedure to that of subsection 1 uses statistical methods outlined in Theil [pp. 134-135] to construct prediction intervals. Let C' represent the estimated cost and accept the assumptions of the standard linear model [5, pp. 110-111]. Then the following probability statement holds:

$$P(\ln C_i' - H \leq \ln C_i \leq \ln C_i + H) = 1-\alpha$$

where

$$H = t_{\alpha/2}(SE)\sqrt{1 + V_o' \; (X'X)^{-1}V_o}$$

X = matrix of independent variables used to construct the model

Vo = vector of independent variables used to predict $\ln C_i$

$t_{\alpha/2}$ = t-statistic

This interval is in logarithms. The transformed interval in costs becomes non-symetric and non-linear in the independent variable of Vo. Thus, it is more accurate to compare the extreme widths of the intervals than the mean values compared in subsection 1.

Prediction intervals were computed for the 100 day period using the 300 day models of Table I. Of the 100 prediction intervals resulting the minimum and maximum interval were transformed to dollars and then divided by the mean cost for the 100 day period to obtain a maximum and minimum width as a percentage of the average cost (parenthetical entries of Table IV). Finally, the percentage of actual costs that fell outside their corresponding prediction interval is reported in the last column of Table IV. Computer programs written to perform these computations are reproduced at Appendices D and E.

	Model	Max. Interval	Min. Interval	% Outside Interval
Airframes	CD	6729 (8.5%)	5365 (6.8%)	4%
	CES	4480 (4.0)	3347 (3.0)	32%
Engines	CD	5375 (12.5)	3783 (8.8)	62%
	CES	6943 (20.5)	4836 (14.3)	29%

TABLE IV. Extreme Widths of 90% Prediction Intervals (in dollars)

3. Accuracy of the Measures

Table III and IV should be roughly comparable by doubling the % error under the 300 observations column of Table III. This value should fall between the maximum and minimum percentage values for the same function in Table IV.

As can be seen, the statistical values of Table IV tend to be smaller when this comparison is made. Moreover, a larger discrepancy between the two tables is accompanied by a larger percentage of the actual costs falling outside of the prediction interval of Table IV.

Some of this difference may be accounted for as interpolation errors for the t-statistic used in the equation at (7) to obtain Table IV. Errors in this statistic are exponential in nature and the resulting prediction intervals were found to be quite sensitive to the value used. The same -statistic value was used for all of the functions in Table IV which seems to imply the value chosen was low. A slight increase in this value would increase the prediction intervals, make Table IV more consistent with Table III, and should, at the same time, decrease the percentage of actual costs falling outside the corresponding prediction interval. More care was taken in selecting this value in Chapter IV where the auditing methodology is carried through completely.

Finally, the uneven prediction results between the cost functions of Table IV may be indicative of the Chow Test's conclusion that the two periods of data, 300 vs. the following 100 days, are in fact different and a model of one period is a poor prediction of costs in another period. This

possibility is important because the periods are not separated by a recognizable technological change. It reemphasizes the need to include the accuracy of the models in the final comparison of estimated costs.

IV. COMPARISON OF BEFORE AND AFTER WIPICS PREDICTED COSTS

A. THE COST FUNCTIONS

The final cost functions used to compare estimated costs across the technological change were obtained using the SNAP/IEDA Computing Package developed by the Department of Statistics, Princeton University. SNAP/IEDA will accept up to 400 observations. In those models requiring over 400 observations the BIMED-02R program, developed by the Health Sciences Computing Facility, University of California, was used for the Cobb-Douglas estimation. The CES estimation was limited to 400 observations in all cases since estimation using the BIMED-02R program would become a 3 stage procedure requiring excessive manipulation and inefficient use of computer time. Also, for the final cost functions, the data periods were altered for two reasons. First, the data periods were chosen close to the technological change so the before and after situations would be as similar as possible, except in technology. Second, the data periods were altered in size and content to reduce the effects of instability as much as possible. The results are presented in Tables V and VI with footnotes indicating the data used.

Note that the CES function for engines across WIPICS was not estimated due to the large number of observations involved. Omission of this function merely precludes performing a Chow test which in all probability would be rejected if performed. Visual comparison of the before and after functions supports this.

	Function	Coefficients				SE	R^2
Before WIPICS[4]	CD	-.297	.857	2.356	-.094	.014	.949
			(.011)	(.090)	(.015)		
	CES	2.999	.886	-10.421		.025	.852
			(.019)	(.543)			
After WIPICS[5]	CD	-1.213	.745	4.222	-.487	.017	.876
			(.071)	(1.234)	(.066)		
	CES	2.098	.881	-2.724		.006	.980
			(.016)	(.293)			
Across WIPICS[6]	CD	2.934	.884	.674	-.179	.020	.893
			(.017)	(.035)	(.023)		
	CES	1.945	.907	-3.424		.031	.778
			(.025)	(.578)			

TABLE V. Airframe Cost Functions

[4] 400 observations from 0316 to 1350.

[5] 90 observations from 2090 to 2179.

[6] Periods 1 and 2 above except dates ending in 3, 5, or 7 deleted to reduce the number of observations to 343. This technique was applied to the before and after case with essentially the same coefficients resulting as reported above. Thus, deletion of some data should not have significantly affected the across WIPICS coefficients.

	Function	Coefficients				SE	R^2
Before WIPICS	CD[7]	2.104	.837 (.018)	.147* (.111)	.494 (.058)	.051	.819
	CES[8]	1.357	.897 (.026)	-.135* (.422)		.059	.755
After WIPICS[9]	CD	4.021	.708 (.020)	-.750 (.163)	.715 (.080)	.029	.922
	CES	-134.11	.477 (.016)	-.812 (.327)		.035	.861
Across WIPICS[10]	CD	3.408	.729 (.013)	.345 (.043)	.271 (.036)	.050	.854
	CES	not estimated					

TABLE VI. Engine Cost Functions

* Not significant at the 5% level.

---

[7] 463 observations from 0184 to 1281.

[8] 400 observations from 0215 to 1250.

[9] 160 observations from 2158 to 2317.

[10] 623 observations for the CD Model.

All coefficients for the airframe functions are significantly different from zero. In addition to the two starred coefficients which were not significant in the engine functions, the coefficient of ln ($^{I}/L$) in the first stage of the before WIPICS CES estimation was not significant. Since the functions were estimated from varying time periods the SE and R^2 are representative of only the respective function and should not be compared across functions. Thus, to characterize the functions the Chow Test and statistical prediction interval discussed in Chapter III were used.

B. STABILITY ACROSS THE CHANGE

The Chow Test was used on the cost functions to determine if they were in fact different before and after WIPICS (Table VII).

	Model	Test Statistic	Critical Value	Results
Airframes	CD	16.94	(4.362) 2.43	Reject
	CES	23.98	(4,362) 2.43	Reject
Engines	CD	8.30	(4,615) 2.43	Reject
	CES	(Not computed)		

TABLE VII. Chow Test Results

In all tests the hypothesis that the before and after WIPICS's cost functions are the same was soundly rejected. This implies the additional conclusion that a technological change "may" have affected the relationship between imputs and outputs.

C. PREDICTION INTERVALS

90% prediction intervals were calculated for the before and after WIPICS's functions by using the functions to predict costs for the last 100 days (90 days for after WIPICS airframe functions) of this respective time periods. The same procedure used to construct Table IV was then used to construct Table VIII.

The most striking result is the improvement obtained in percent of observations falling outside the prediction interval. This occurred because the 100 costs predicted were in fact a subset of the sample used to construct the cost functions. A second difference from Table IV is the size of the prediction intervals. The change was mixed, some larger and some smaller. This again points to the relatively unstable situation at NARFNI in which prices and amounts of inputs appear to be varying widely.

Although the prediction intervals are non-symetric about the predicted cost, one half of the maximum interval should safely represent at least two standard errors of the cost

		Model	Maximum Interval	Minimum Interval	% Outside Interval
Before WIPICS	Airframes	CD	4122 (4.9%)	3461 (4.1%)	14.0%
		CES	10760 (9.0%)	8740 (7.3%)	11.0%
	Engines	CD	8287 (20.6%)	4057 (10.1%)	7.0%
		CES	7788 (23.1%)	5319 (15.7%)	25%
After WIPICS	Airframes	CD	5429 (6.3%)	4698 5.5%	13.0%
		CES	2700 (2.2%)	2270 (1.9%)	6.0%
	Engines	CD	4113 (11.3%)	2818 (7.7%)	10%
		CES	4041 (13.1%)	2943 (9.6%)	21%

TABLE VIII. Extreme Widths of 90% Prediction Intervals (in dollars)

function. This value will be used to make a significance statement about the cost comparison of operating with and without WIPICS.

D. DIRECT COMPARISON OF PREDICTED COSTS

Following the comparison procedures discussed in Section E, Chapter II, the cost differentials in Tables IX and X were obtained.

	CD (BW-AW)	CES (BW-AW)
Before WIPICS Data	$17885	$3306
After WIPICS Data	$9241	$7129

TABLE IX. Difference Between Predicted Costs[11] - Airframes

---

11 Positive value indicates operation with WIPICS is estimated to be cheaper.

	CD (AW-AW)	CES (AW-AW)
Before WIPICS Data	\$5126	\$5286
After WIPICS Data	\$1152	\$3893

TABLE X. Difference Between Predicted Costs[12] - Engines

Table IX is read as saying, "Based on the before and after WIPICS Cobb-Douglas cost functions it is estimated that WIPICS could have saved NARFNI \$17,885 per day in the airframe program during the period 0316 to 1350, had WPICS been in operation at that time." Notice that this says nothing about changes which these cost functions cannot measure, such as an arbitrary change in the NORMS assigned to in coming repair items. These factors will be considered in Chapter V. In addition, the statement does not consider the inaccuracies of the models which were measured in Table VIII. It should be qualified by the assumption that the difference is not significant unless it exceeds, in absolute value, the sum of one-half of the two maximum prediction

[12] Positive value indicates operation with WIPICS is estimated to be cheaper.

intervals of the cost functions involved. In the above example this sum is $4776 (computed from Table VIII). Thus, the statement is significant with at least 90% confidence (again, disregarding externalities to be discussed in Chapter V).

Using the above procedure to interpret Tables IX and X the CD models indicate a significant advantage in the airframe program and an insignificant disadvantage in the engine program. The CES models indicate an insignificant WIPICS advantage in both programs.

The above comparison could be refined by removing the effects of externalities. This should reduce the total variance of costs and it should reduce the maximum prediction intervals of the cost functions. The net result would then be a smaller region in which the cost differential would be considered insignificant, but also possibly smaller indicated cost savings.

V. VARIABLES EXOGENEOUS TO WIPICS

The Cobb-Douglas and CES models do an imperfect job of estimating the effect of WIPICS on production costs due to many changes within the periods which were not caused by WIPICS. If the major changes were isolated, and the data corrected to account for them, then the proceedures discussed in this thesis should give an acceptable estimation of WIPICS' effect. Some of these changes are noted below.

A. PRICE CHANGES

Looking at the minimization problem of Chapter II, an increase in the price of an input would result in higher costs to produce a given level of output. Alternatively, a cost function estimated from data with low prices would tend to underestimate the cost of production for data taken when prices are high. For this reason increasing prices would depreciate the apparent effect of a technological change. The price of direct labor and penalty costs are accounted for in the cost functions used for this study so their fluctuations should not affect the final comparison of predicted costs. This is not the case for material prices and the prices of indirect labor absorbed into overhead. Shifts in these latter prices could, and should, be corrected by the application of a price index.

B. COMMAND POLICY CHANGES

This area is often elusive and difficult to identify with specific actions. However, obvious changes, such as a new ceiling on allowable overtime, should be accounted for. An increase in overtime, if not a result of command policy changes, may be caused by temporary inefficiency and shop conjestion due to the learning process that often follows a technological change. In this case the correction would consist of identifying the period affected and deleting it from the study.

Another example is a shift in the standards for assigning NORMS at NARFNI. The shift is acceptable if experience shows that required labor hours have actually changed. Any other reason for the shift would result in an imaginary shift in the production function with a concurrent change in the derived cost function. This type of bias could also be corrected by application of an index to the data before estimating the cost functions.

C. PERSONNEL TURNOVER

A season of large personnel cuts followed by hiring of new personnel would naturally establish a training period in NARFNI. During this period the relative efficiency of workers would be low and a corresponding change in the cost function would be noted. If the training occurred during a

period used to estimate a cost function the function would inherit a bias resulting in comparison errors. The effect is complex, however, it may be that wages paid to personnel are low enough, relatively speaking, to allow the cost of production at a given level to remain approximately constant. Still, the relation between the inputs would be altered and a detailed study would be required to correct for the bias.

D. CHANGES IN TYPE OF WORK REQUIRED

In Chapter I it was explained that NARFNI has many different outputs in the form of repairs to various types of airframes and engines. These numerous outputs were aggregated into only two products, repairs of airframes and engines. The cost functions associated with these two products should do an acceptable job of predicting costs so long as the mix of work remains fairly constant within the respective programs. A shift in work type cannot be accounted for by the cost functions. Unfortunately, there is strong evidence that the work loads are shifting considerably. An approach to accounting for these shifts is discussed in Section C of Chapter VI, PROBLEMS OF FURTHER RESEARCH.

VI. CONCLUSIONS AND PROBLEMS OF FURTHER RESEARCH

A. EFFECTIVENESS OF WIPICS

The comparison of estimated costs for the "with" and "without" WIPICS situations indicated a savings in the airframe program and a loss in the engine program. The results of the two program comparisons are not additive due to the difference in time periods considered in each program. In addition, the component parts program was excluded from the study because of data format. For these reasons, an overall conclusion concerning the cost-effectiveness of WIPICS could not be extracted from this study.

Upon completion of the study it was found that WIPICS had not been fully operational in the engine and airframe programs for the periods originally stated. Numerous problems in implementing the system prevented a complete test of the system during this period. WIPICS has been completely operational in the airframe program since October of 1972 but was not operational in the engine program as of 4 May, 1973.

The indication of significant savings in the airframe program may be explained by shifts in the external variables discussed in Chapter V, a prime suspect being changes in the types of work.

B. AUDITING METHODOLOGY

Investigation of the auditing methodology originally proposed by Spooner revealed eight primary steps that are essential to arriving at a strong conclusion:

1. Identify external variations such as command policies and inflation of prices so they may be accounted for in the data.
2. Correct the data for the variations identified in 1 above so the situations before and after the technological change will be as similar as possible.
3. Aggregate the data.
4. Select the periods to study, keeping in mind that closeness to the change will aid in stabilizing functions while, at the same time, a delay may be needed to allow the technological change to become noticeable.
5. Estimate the cost functions.
6. Estimate the accurracy of the functions.
7. Compare estimated costs derived from the cost functions.
8. Draw conclusions from 6 and 7 above.

The audit conclusions may be more meaningful if identical time periods are used in each program studied (assuming there is more than one). This will allow the separate effects to be additive for an overall statement about the effectiveness of the change.

Both the Cobb-Douglas and CES cost functions appeared to vary in ability to represent the production relation of inputs to outputs. Neither function dominated the other in accuracy therefore no conclusion can be made as to which should be used. If only one is to be used the natural choice is the simpler Cobb-Douglas function.

The results of the WIPICS test case indicate there remain problems with the accuracy of the tests. It is believed that relatively simple treatment of the data for external influences would improve this accuracy.

C. PROBLEMS OF FURTHER RESEARCH

There are three primary areas in the auditing of cost-effectiveness analyses undergoing current research at the Naval Postgraduate School.

First, Professor James Hartman is applying search techniques in an attempt to improve the estimation of the parameters in the CES cost functions. The 2-stage least-squares regression used in this thesis results in two estimates of the elasticity of substitution in the production function, both of which are significant. The problem is that the two estimates are invariably quite different. It is hoped that better estimates of this parameter will result in a more accurate CES cost function for use in the auditing methodology.

Second, Professor Norman K. Womer is investigating methods of accounting for the shifting of work type in the various programs which is believed to be responsible for much of the inaccuracies in the models used in this thesis. The principal effort in this area is toward developing a computer program to perform the regressions on raw data instead of the aggregated data. Dummy variables are being employed, one for each type of airframe or engine, to account for shifting work type. This requires a number of variables exceeding the capabilities of the computer soft-ware presently available.

Finally, Captain Richard McGarrahan, USA, is investigating a second auditing methodology proposed by Spooner which employs a linear input-output production function instead of the continuous production functions assumed in this thesis. The objective of the work is to establish a basis by which to judge the abilities of the continuous models. The input-output model is expected to be more accurate in that it treats each type of work independently and should therefore be more stable. If the continuous models compare favorably in accuracy they would then be considered more desirable for their ease in handling.

APPENDIX A

COST COMPARISON PROGRAM

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                       C
C     COST COMPARISON OF BW VS. AW                                      C
C           (C-D MODEL FOR ENGINES)                                     C
C           (CES MODEL FOR ENGINES)                                     C
C                                                                       C
C     ( FOR AIRFRAME COSTS CHANGE READ FORMAT )                         C
C                                                                       C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      DIMENSION D(600,7),X(600,3),TIME(600),ACCST(600)
C
C     INITIALIZE SWITCH FOR CES COMPARISON AFTER THE CD COMPARISON
C
      ISIG=0
C
C     INITIALIZE PARAMETERS FOR CD RUN
C     NUM= # OF OBSERVATIONS
C     NUM1= # OF OBSERVATICNS BEFORE THE CHANGE
C     NUM2= # OF OBSERVATIONS AFTER THE CHANGE
C
      NUM=467
      NUM1=400
      NUM2=67
      BA=2.104
      BB1=.837
      BB2=.147
      BB3=.494
      AA=15.437
      AB1=.622
      AB2=-.248
      AB3=-2.514
C
C     INPUT DATA AND COMPUTE ACTUAL TOTAL COST
C
      DC 10 I=1,NUM
      READ(5,900) (D(I,J),J=1,7)
      ACOST(I)=D(I,3)+D(I,4)+D(I,5)+D(I,6)
   10 CCNTINUE
  900 FORMAT(9X,F7.2,1X,F7.2,1X,F8.2,1X,F8.2,1X,F8.2,1X,F7.2,1X,F4.0)
C
```

```
C      NORM  DLH  DL$  M$  OVHD$  P$  NI
C
C
C      INITIALIZE LOCATION FOR MEAN MATERIAL AND OVERHEAD COST,
C      BEFORE AND AFTER THE CHANGE
C
       QMB=0.
       QMA=0.
       QOB=0.
       QOA=0.
       DO 12 I=1,NUM1
       QMB=QMB+D(I,4)/NUM1
       QOB=QOB+D(I,5)/NUM1
    12 CONTINUE
       NUMP=NUM1+1
       DO 13 I=NUMP,NUM
       QMA=QMA+D(I,4)/NUM2
       QOA=QOA+D(I,5)/NUM2
    13 CONTINUE
       WRITE(6,901) QMB,QMA,QOB,QOA
   901 FORMAT (' ',///,'QMB,QMA,QOB,QOA',4F10.1,///)
       DO 20 I=1,NUM
       TIME(I)=I
       X(I,1)=D(I,1)
       X(I,2)=(D(I,3)/D(I,2))
       X(I,3)=(D(I,6)/D(I,7))
    20 CONTINUE
C
C      PREDICT COSTS AND TAKE DIFFERENCE BETWEEN BEFORE AND AFTER
C      MODELS
C
       DO 30 I=1,NUM
       D(I,1)=EXP(BA)*X(I,1)**BB1*X(I,2)**BB2*X(I,3)**BB3+QOB
       D(I,2)=EXP(AA)*X(I,1)**AB1*X(I,2)**AB2*X(I,3)**AB3+QOA
       D(I,3)=D(I,1)-D(I,2)
    30 CONTINUE
    35 WRITE(6,910) NUM1
   910 FORMAT('1','COST VS. TIME FOR BW(.) AND AW(+) MODELS USING  ',I4,'
      1 BW OBSERVATIONS.')
       CALL PLOTP(TIME(1),D(1,1),NUM1,1)
       CALL PLOTP(TIME(1),D(1,2),NUM1,3)
       I=NUM1+1
       WRITE(6,911) NUM2
   911 FORMAT('1','COST VS. TIME FOR BW(.) AND AW(+) MODELS USING ',I4,'
      2 AW OBSERVATIONS.')
       CALL PLOTP(TIME(I),D(I,1),NUM2,1)
       CALL PLOTP(TIME(I),D(I,2),NUM2,3)
       DO 40 I=1,NUM
```

```
      WRITE(6,912) I,D(I,1),D(I,2),D(I,3)
   40 CCNTINUE
  912 FORMAT(' ',I4,10X,'BW IS ',F10.2,10X,'AW IS ',F10.2,10X,F10.2)
C
C     AVERAGE THE BEFORE AND AFTER DIFFERENCE SEPERATELY
C
      QB=0.0
      DC 50 I=1,NUM1
      QB=QB+D(I,3)/NUM1
   50 CCNTINUE
      QA=0.0
      DO 60 I=NUMP,NUM
      QA=QA+D(I,3)/NUM2
   60 CCNTINUE
      WRITE(6,913) QB,QA
  913 FORMAT('1','MEAN DIFFERENCE BW IS ',F10.1,10X,'AW IS ',F10.1)
C
C     AS A CHECK, COMPARE ACTUAL COST WITH THE PREDICTED CCST
C
      AC=0.
      PC=0.
      DC 61 I=1,NUM1
      AC=AC+ACOST(I)/NUM1
      PC=PC+D(I,1)/NUM1
   61 CONTINUE
      WRITE(6,914) AC,PC
  914 FORMAT(' ',//,' BW AC IS ',F15.0,10X,' BW PC IS ',F15.0)
      AC=0.
      PC=0.
      DC 62 I=NUMP,NUM
      AC=AC+ACOST(I)/NUM2
      PC=PC+D(I,2)/NUM2
   62 CCNTINUE
      WRITE(6,915) AC,PC
  915 FORMAT(' ',' AW AC IS ',F15.0,10X,' AW PC IS ',F15.0,//)
C
C     IF ISIG EQUALS 0 REPEAT PROCEDURE FOR CES
C
      IF(ISIG.EQ.1) GO TO 100
      ISIG=1
      BA11=.242
      BA12=-1.577
      BA21=1.357
      BA22=.897
      BA23=-.135
      AA11=-6.748
      AA12=2.310
      AA21=-4.556
```

```
      AA22=.433
      AA23=-3.520
      DO 70 I=1,NUM
      Z=EXP(BA11+BA12*ALOG(X(I,3)/X(I,2)))
      C1=EXP(BA11/BA12)+Z**((BA12+1.0)/BA12)
      C2=EXP(BA11/BA12)+1.0
      C=ALOG(C1/C2)
      D(I,1)=(X(I,2)+X(I,3)*Z)*EXP(BA21)*X(I,1)**BA22*EXP(BA23*C)+QMB
      Z=EXP(AA11+AA12*ALOG(X(I,3)/X(I,2)))
      C1=EXP(AA11/AA12)+Z**((AA12+1.0)/AA12)
      C2=EXP(AA11/AA12)+1.0
      C=ALOG(C1/C2)
      D(I,2)=(X(I,2)+X(I,3)*Z)*EXP(AA21)*X(I,1)**AA22*EXP(AA23*C)+QMA
      D(I,3)=D(I,1)-D(I,2)
   70 CONTINUE
      GO TO 35
  100 STCP
      END
```

APPENDIX B

SUMMARY OF DAILY STATISTICS OF NARF (ENGINE)

DATA FOR JULIAN DATES 2003 TC 3050

TOTAL NUMBER OF OBSERVATIONS = 523

DAY	JUL DATE	NORM	DIR LH	DIR L$	DIR M$	OVHD$	P$	I
1	2003	10.94	11.92	76.02	177.81	93.11	61.64	1.
2	2004	10.94	11.92	76.02	177.81	93.11	61.64	1.
3	2005	10.94	11.92	76.02	177.81	93.11	61.64	1.
4	2006	10.94	11.92	76.02	177.81	93.11	61.64	1.
5	2007	10.94	11.92	76.02	177.81	93.11	61.64	1.
6	2008	10.94	11.92	76.02	177.81	93.11	61.64	1.
7	2009	10.94	11.92	76.02	177.81	93.11	61.64	1.
8	2010	10.94	11.92	76.02	177.81	93.11	61.64	1.
9	2011	10.94	11.92	76.02	177.81	93.11	61.64	1.
10	2012	10.94	11.92	76.02	177.81	93.11	61.64	1.
11	2013	10.94	11.92	76.02	177.81	93.11	61.64	1.
12	2014	10.94	11.92	76.02	177.81	93.11	61.64	1.
13	2015	10.94	11.92	76.02	177.81	93.11	61.64	1.
14	2016	10.94	11.92	76.02	177.81	93.11	61.64	1.
15	2017	10.94	11.92	76.02	177.81	93.11	61.64	1.
16	2018	10.94	11.92	76.02	177.81	93.11	61.64	1.
17	2019	10.94	11.92	76.02	177.81	93.11	61.64	1.
18	2020	10.94	11.92	76.02	177.81	93.11	61.64	1.
19	2021	10.94	11.92	76.02	177.81	93.11	61.64	1.
20	2022	10.94	11.92	76.02	177.81	93.11	61.64	1.
21	2023	10.94	11.92	76.02	177.81	93.11	61.64	1.
22	2024	10.94	11.92	76.02	177.81	93.11	61.64	1.
23	2025	10.94	11.92	76.02	177.81	93.11	61.64	1.
24	2026	10.94	11.92	76.02	177.81	93.11	61.64	1.
25	2027	18.84	28.56	184.72	288.90	231.81	118.97	2.
26	2028	18.84	28.56	184.72	288.90	231.81	118.97	2.
27	2029	18.84	28.56	184.72	288.90	231.81	118.97	2.
28	2030	18.84	28.56	184.72	288.90	231.81	118.97	2.
29	2031	18.84	28.56	184.72	288.90	231.81	118.97	2.
30	2032	18.84	28.56	184.72	288.90	231.81	118.97	2.
31	2033	18.84	28.56	184.72	288.90	231.81	118.97	2.

32	2034	18.84	28.56	184.72	288.90	231.81	118.97	2.
33	2035	18.84	28.56	184.72	288.90	231.81	118.97	2.
34	2036	18.84	28.56	184.72	288.90	231.81	118.97	2.
35	2037	18.84	28.56	184.72	288.90	231.81	118.97	2.
36	2038	18.84	28.56	184.72	288.90	231.81	118.97	2.
37	2039	18.84	28.56	184.72	288.90	231.81	118.97	2.
38	2040	18.84	28.56	184.72	288.90	231.81	118.97	2.
39	2041	18.84	28.56	184.72	288.90	231.81	118.97	2.
40	2042	30.05	40.47	263.81	375.81	334.75	153.22	3.
41	2043	30.05	40.47	263.81	375.81	334.75	153.22	3.
42	2044	30.05	40.47	263.81	375.81	334.75	153.22	3.
43	2045	30.05	40.47	263.81	375.81	334.75	153.22	3.
44	2046	30.05	40.47	263.81	375.81	334.75	153.22	3.
45	2047	30.05	40.47	263.81	375.81	334.75	153.22	3.
46	2048	30.05	40.47	263.81	375.81	334.75	153.22	3.
47	2049	30.05	40.47	263.81	375.81	334.75	153.22	3.
48	2050	30.05	40.47	263.81	375.81	334.75	153.22	3.
49	2051	30.05	40.47	263.81	375.81	334.75	153.22	3.
50	2052	30.05	40.47	263.81	375.81	334.75	153.22	3.
51	2053	30.05	40.47	263.81	375.81	334.75	153.22	3.
52	2054	30.05	40.47	263.81	375.81	334.75	153.22	3.
53	2055	35.09	46.20	301.22	425.29	384.40	210.55	4.
54	2056	24.15	34.28	225.20	247.48	291.29	148.91	3.
55	2057	24.15	34.28	225.20	247.48	291.29	148.91	3.
56	2058	24.15	34.28	225.20	247.48	291.29	148.91	3.
57	2059	24.15	34.28	225.20	247.48	291.29	148.91	3.
58	2060	44.61	52.87	362.15	624.17	468.97	206.24	4.
59	2061	44.61	52.87	362.15	624.17	468.97	206.24	4.
60	2062	44.61	52.87	362.15	624.17	468.97	206.24	4.
61	2063	44.61	52.87	362.15	624.17	468.97	206.24	4.
62	2064	44.61	52.87	362.15	624.17	468.97	206.24	4.
63	2065	44.61	52.87	362.15	624.17	468.97	206.24	4.
64	2066	44.61	52.87	362.15	624.17	468.97	206.24	4.
65	2067	55.72	66.78	454.15	813.64	594.08	224.05	5.
66	2068	55.72	66.78	454.15	813.64	594.08	224.05	5.
67	2069	55.72	66.78	454.15	813.64	594.08	224.05	5.
68	2070	55.72	66.78	454.15	813.64	594.08	224.05	5.
69	2071	55.72	66.78	454.15	813.64	594.08	224.05	5.
70	2072	55.72	66.78	454.15	813.64	594.08	224.05	5.
71	2073	55.72	66.78	454.15	813.64	594.08	224.05	5.
72	2074	55.72	66.78	454.15	813.64	594.08	224.05	5.
73	2075	44.50	54.87	375.06	726.73	491.14	189.80	4.
74	2076	44.50	54.87	375.06	726.73	491.14	189.80	4.
75	2077	44.50	54.87	375.06	726.73	491.14	189.80	4.
76	2078	44.50	54.87	375.06	726.73	491.14	189.80	4.
77	2079	44.50	54.87	375.06	726.73	491.14	189.80	4.
78	2080	44.50	54.87	375.06	726.73	491.14	189.80	4.
79	2081	77.35	91.38	610.71	1182.74	803.19	257.00	6.

80	2082	74.17	85.46	556.30	977.63	730.75	257.00	6.
81	2083	74.17	85.46	556.30	977.63	730.75	257.00	6.
82	2084	78.41	80.00	519.49	1157.86	685.88	217.48	6.
83	2085	78.41	80.00	519.49	1157.86	685.88	217.48	6.
84	2086	78.41	80.00	519.49	1157.86	685.88	217.48	6.
85	2087	78.41	80.00	519.49	1157.86	685.88	217.48	6.
86	2088	78.41	80.00	519.49	1157.86	685.88	217.48	6.
87	2089	101.40	101.17	657.51	1535.69	863.42	284.68	8.
88	2090	101.40	101.17	657.51	1535.69	863.42	284.68	8.
89	2091	127.56	136.84	889.29	1855.12	1133.07	351.88	10.
90	2092	127.56	136.84	889.29	1855.12	1133.07	351.88	10.
91	2093	127.56	136.84	889.29	1855.12	1133.07	351.88	10.
92	2094	173.64	188.93	1230.90	2420.89	1559.37	449.14	13.
93	2095	280.05	305.26	1999.74	3237.59	2520.86	764.32	20.
94	2096	360.29	385.10	2524.83	4497.20	3171.88	1019.11	27.
95	2097	431.68	458.85	3008.23	5343.51	3772.80	1153.51	31.
96	2098	508.06	540.22	3541.73	6218.35	4442.07	1343.99	35.
97	2099	508.06	540.22	3541.73	6218.35	4442.07	1343.99	35.
98	2100	508.06	540.22	3541.73	6218.35	4442.07	1343.99	35.
99	2101	598.33	614.28	4035.16	7399.17	5046.24	1498.87	41.
100	2102	665.05	682.15	4487.08	8372.68	5604.21	1633.26	45.
101	2103	689.40	707.82	4654.00	8763.31	5792.81	1726.21	48.
102	2104	786.28	786.32	5176.18	10146.61	6432.91	1931.61	54.
103	2105	825.38	828.16	5461.39	10440.65	6766.33	2074.12	58.
104	2106	825.38	828.16	5461.39	10440.65	6766.33	2074.12	58.
105	2107	825.38	828.16	5461.39	10440.65	6766.33	2074.12	58.
106	2108	901.80	886.13	5842.90	11138.23	7232.92	2265.85	63.
107	2109	980.95	954.39	6297.41	12283.94	7795.12	2430.31	68.
108	2110	1050.42	1025.91	6770.67	13237.05	8389.61	2576.96	72.
109	2111	1059.49	1035.88	6838.05	13413.88	8476.99	2653.79	73.
110	2112	1097.90	1075.11	7100.00	13871.83	8793.73	2756.61	77.
111	2113	1097.90	1075.11	7100.00	13871.83	8793.73	2756.61	77.
112	2114	1097.90	1075.11	7100.00	13871.83	8793.73	2756.61	77.
113	2115	1132.82	1117.95	7383.12	14540.56	9152.40	2889.76	80.
114	2116	1228.45	1200.35	7925.49	15718.89	9831.79	3087.22	86.
115	2117	1307.01	1274.28	8420.46	16760.69	10430.04	3274.81	91.
116	2118	1357.19	1320.61	8725.57	17722.81	10806.54	3355.25	95.
117	2119	1333.33	1292.24	8540.27	17082.92	10569.91	3314.14	94.
118	2120	1333.33	1292.24	8540.27	17082.92	10569.91	3314.14	94.
119	2121	1333.33	1292.24	8540.27	17082.92	10569.91	3314.14	94.
120	2122	1332.90	1293.68	8551.05	17143.24	10594.95	3357.97	94.
121	2123	1423.01	1386.96	9167.07	18519.40	11359.90	3558.80	101.
122	2124	1424.40	1418.48	9375.49	18674.12	11614.71	3684.75	105.
123	2125	1477.02	1474.06	9749.76	19351.57	12091.65	3769.76	108.
124	2126	1453.55	1451.53	9612.37	19133.94	11923.49	3718.78	106.
125	2127	1453.55	1451.53	9612.37	19133.94	11923.49	3718.78	106.
126	2128	1453.55	1451.53	9612.37	19133.94	11923.49	3718.78	106.
127	2129	1409.81	1409.44	9328.06	18534.33	11592.26	3644.92	101.

128	2130	1404.98	1400.31	9274.63	18723.48	11528.78	3650.24	100.
129	2131	1384.91	1383.21	9177.26	18372.13	11404.79	3603.62	98.
130	2132	1400.58	1379.80	9173.09	18652.79	11439.72	3606.29	99.
131	2133	1428.31	1395.26	9290.23	19595.32	11601.44	3596.71	100.
132	2134	1428.31	1395.26	9290.23	19595.32	11601.44	3596.71	100.
133	2135	1428.31	1395.26	9290.23	19595.32	11601.44	3596.71	100.
134	2136	1469.99	1436.83	9577.39	20163.66	11982.38	3676.31	100.
135	2137	1508.63	1463.60	9776.93	20618.28	12240.96	3728.37	102.
136	2138	1521.78	1466.89	9814.81	21148.78	12304.20	3747.70	102.
137	2139	1497.74	1435.73	9598.30	20570.11	12072.50	3632.02	102.
138	2140	1491.99	1419.20	9545.30	20130.65	12011.65	3720.66	104.
139	2141	1491.99	1419.20	9545.30	20130.65	12011.65	3720.66	104.
140	2142	1491.99	1419.20	9545.30	20130.65	12011.65	3720.66	104.
141	2143	1549.97	1466.92	9911.52	20144.73	12498.90	3854.82	105.
142	2144	1474.12	1374.10	9311.46	19165.71	11763.67	3665.69	99.
143	2145	1545.94	1458.74	9917.38	19607.56	12552.72	3900.00	103.
144	2146	1562.33	1473.78	10048.83	19662.20	12743.48	3931.58	103.
145	2147	1599.49	1503.98	10291.16	19912.27	13077.18	4011.03	105.
146	2148	1599.49	1503.98	10291.16	19912.27	13077.18	4011.03	105.
147	2149	1599.49	1503.98	10291.16	19912.27	13077.18	4011.03	105.
148	2150	1599.49	1503.98	10291.16	19912.27	13077.18	4011.03	105.
149	2151	1708.77	1605.54	10999.84	21265.42	14006.58	4158.92	109.
150	2152	1692.08	1584.65	10910.02	21316.50	13908.41	4068.60	107.
151	2153	1730.77	1616.47	11148.14	21323.97	14235.57	4174.06	108.
152	2154	1796.04	1668.83	11526.74	21892.13	14730.07	4286.60	109.
153	2155	1796.04	1668.83	11526.74	21892.13	14730.07	4286.60	109.
154	2156	1796.04	1668.83	11526.74	21892.13	14730.07	4286.60	109.
155	2157	1855.93	1705.91	11824.20	22240.30	15099.66	4375.68	110.
156	2158	1901.59	1756.39	12169.65	22985.06	15554.03	4436.02	111.
157	2159	1895.06	1760.22	12212.13	23188.16	15602.46	4459.37	109.
158	2160	1926.62	1782.52	12399.75	23372.71	15840.86	4479.84	111.
159	2161	1970.56	1805.52	12589.01	23943.89	16079.97	4559.85	113.
160	2162	1970.56	1805.52	12589.01	23943.89	16079.97	4559.85	113.
161	2163	1970.56	1805.52	12589.01	23943.89	16079.97	4559.85	113.
162	2164	2010.02	1823.07	12704.56	23967.01	16244.21	4635.14	113.
163	2165	2078.88	1873.64	13049.48	24684.86	16681.29	4765.39	117.
164	2166	2060.56	1930.05	13586.75	24346.86	16451.03	4842.80	117.
165	2167	2073.75	1935.18	13629.11	24387.12	16480.43	4971.63	120.
166	2168	1934.88	1804.18	12745.39	22368.71	15357.20	4597.72	110.
167	2169	1934.88	1804.18	12745.39	22368.71	15357.20	4597.72	110.
168	2170	1934.88	1804.18	12745.39	22368.71	15357.20	4597.72	110.
169	2171	1920.89	1786.05	12609.13	21742.17	15185.73	4578.66	108.
170	2172	1943.05	1823.09	12845.69	22129.46	15467.86	4712.81	110.
171	2173	1952.35	1825.98	12848.64	22293.98	15428.75	4831.79	112.
172	2174	1941.85	1818.63	12774.09	22638.00	15326.76	4770.14	111.
173	2175	1900.17	1766.26	12380.54	22075.96	14799.88	4695.97	108.
174	2176	1900.17	1766.26	12380.54	22075.96	14799.88	4695.97	108.
175	2177	1900.17	1766.26	12380.54	22075.96	14799.88	4695.97	108.

176	2178	1764.42	1647.71	11443.12	20794.90	13578.89	4322.48	99.
177	2179	1868.72	1712.40	11874.98	21705.07	14106.01	4552.88	105.
178	2180	1944.62	1773.56	12290.71	22255.08	14610.15	4780.49	110.
179	2181	2019.49	1840.05	12748.96	24194.77	15152.11	5003.69	117.
180	2182	2093.31	1915.73	13267.51	25430.25	15774.38	5263.06	126.
181	2183	2093.31	1915.73	13267.51	25430.25	15774.38	5263.06	126.
182	2184	2093.31	1915.73	13267.51	25430.25	15774.38	5263.06	126.
183	2185	2093.31	1915.73	13267.51	25430.25	15774.38	5263.06	126.
184	2186	2093.31	1915.73	13267.51	25430.25	15774.38	5263.06	126.
185	2187	1985.34	1793.75	12502.55	23706.83	14735.30	5146.48	123.
186	2188	2034.92	1849.31	12882.91	23669.06	15181.00	5395.96	127.
187	2189	2055.93	1882.69	13096.20	23932.75	15446.66	5409.64	128.
188	2190	2055.93	1882.69	13096.20	23932.75	15446.66	5409.64	128.
189	2191	2055.93	1882.69	13096.20	23932.75	15446.66	5409.64	128.
190	2192	2091.18	1925.31	13394.79	24297.21	15767.18	5443.84	129.
191	2193	2069.57	1911.39	13295.05	24304.43	15604.57	5400.18	129.
192	2194	2106.02	1949.02	13541.71	24389.91	15886.13	5512.57	132.
193	2195	2140.98	2000.00	13883.28	24325.39	16287.04	5706.84	136.
194	2196	2101.06	1976.92	13774.93	23585.36	16046.02	5693.22	136.
195	2197	2101.06	1976.92	13774.93	23585.36	16046.02	5693.22	136.
196	2198	2101.06	1976.92	13774.93	23585.36	16046.02	5693.22	136.
197	2199	2015.53	1924.12	13389.80	23152.88	15652.10	5461.97	132.
198	2200	1944.56	1844.77	12137.87	22428.33	14969.74	5335.15	129.
199	2201	1994.26	1892.96	12469.82	22915.45	15364.20	5448.68	132.
200	2202	2005.89	1908.15	12558.98	22667.91	15378.56	5487.18	134.
201	2203	1987.07	1899.16	12484.22	22423.71	15287.24	5457.03	135.
202	2204	1987.07	1899.16	12484.22	22423.71	15287.24	5457.03	135.
203	2205	1987.07	1899.16	12484.22	22423.71	15287.24	5457.03	135.
204	2206	1960.78	1894.55	12456.75	22785.28	15218.78	5383.26	134.
205	2207	2007.07	1878.98	12901.03	23333.45	15756.11	5548.67	138.
206	2208	1992.80	1886.38	12914.30	22910.96	15771.63	5474.95	137.
207	2209	2003.13	1908.82	13065.10	22858.39	15946.69	5491.23	136.
208	2210	1970.39	1873.60	12758.52	21716.73	15561.36	5451.19	133.
209	2211	1970.39	1873.60	12758.52	21716.73	15561.36	5451.19	133.
210	2212	1970.39	1873.60	12758.52	21716.73	15561.36	5451.19	133.
211	2213	1966.71	1893.08	12884.23	22005.52	15705.14	5514.24	135.
212	2214	2033.22	1972.62	13413.67	22792.55	16347.05	5594.94	138.
213	2215	2077.50	2013.30	13686.86	22775.09	16675.95	5688.16	139.
214	2216	2006.92	1971.65	13385.14	21202.93	16289.16	5530.36	137.
215	2217	1952.61	1933.98	13123.16	20271.35	15959.42	5290.45	132.
216	2218	1952.61	1933.98	13123.16	20271.35	15959.42	5290.45	132.
217	2219	1952.61	1933.98	13123.16	20271.35	15959.42	5290.45	132.
218	2220	1935.84	1926.60	13068.21	20789.04	15912.29	5102.60	129.
219	2221	1885.53	1883.90	12775.68	20216.75	15550.89	4998.09	126.
220	2222	1912.67	1906.16	12925.12	20254.82	15732.38	5067.96	129.
221	2223	1949.23	1938.64	13154.36	20528.33	16017.32	5204.73	132.
222	2224	1913.50	1905.86	12930.98	20124.25	15746.24	5060.71	129.
223	2225	1913.50	1905.86	12930.98	20124.25	15746.24	5060.71	129.

224	2226	1913.50	1905.86	12930.98	20124.25	15746.24	5060.71	129.
225	2227	1939.12	1944.39	13192.79	20668.86	16069.04	5141.12	130.
226	2228	1918.65	1935.43	13132.69	20507.88	15991.14	5131.25	129.
227	2229	1954.59	1965.95	13329.10	21073.59	16240.78	5232.70	132.
228	2230	1951.74	1960.03	13296.50	20854.56	16224.56	5076.43	129.
229	2231	1946.13	1939.74	13167.56	20048.43	16081.63	4958.54	127.
230	2232	1946.13	1939.74	13167.56	20048.43	16081.63	4958.54	127.
231	2233	1946.13	1939.74	13167.56	20048.43	16081.63	4958.54	127.
232	2234	1887.00	1857.36	12598.80	19430.97	15416.19	4732.86	123.
233	2235	1851.13	1849.06	12538.93	19147.34	15352.27	4666.92	122.
234	2236	1768.21	1777.38	12034.90	19007.41	14768.70	4461.26	118.
235	2237	1667.69	1698.09	11442.21	17894.57	14109.34	4346.09	116.
236	2238	1719.12	1757.33	11827.49	18329.27	14599.82	4537.98	121.
237	2239	1719.12	1757.33	11827.49	18329.27	14599.82	4537.98	121.
238	2240	1719.12	1757.33	11827.49	18329.27	14599.82	4537.98	121.
239	2241	1725.43	1756.34	11824.57	18385.69	14613.42	4506.84	120.
240	2242	1688.20	1722.68	11589.64	18055.55	14253.41	4368.54	118.
241	2243	1644.24	1675.89	11260.54	17521.73	13890.75	4175.66	111.
242	2244	1589.74	1644.92	11043.99	16577.53	13738.08	4185.00	108.
243	2245	1551.04	1600.12	10737.43	16209.57	13381.73	4106.97	106.
244	2246	1551.04	1600.12	10737.43	16209.57	13381.73	4106.97	106.
245	2247	1551.04	1600.12	10737.43	16209.57	13381.73	4106.97	106.
246	2248	1551.04	1600.12	10737.43	16209.57	13381.73	4106.97	106.
247	2249	1543.60	1603.05	10744.79	16821.11	13427.89	4021.27	103.
248	2250	1552.16	1614.81	10811.42	17190.46	13549.19	4041.85	103.
249	2251	1524.67	1591.16	10630.74	17191.61	13374.87	4054.10	103.
250	2252	1462.07	1529.71	10196.56	16652.57	12885.70	3989.84	100.
251	2253	1462.07	1529.71	10196.56	16652.57	12885.70	3989.84	100.
252	2254	1462.07	1529.71	10196.56	16652.57	12885.70	3989.84	100.
253	2255	1443.96	1520.27	10118.98	16726.87	12827.23	3946.18	100.
254	2256	1406.28	1493.82	9933.13	16579.14	12615.81	3862.59	98.
255	2257	1435.41	1541.93	10280.93	17369.21	13082.39	3936.31	99.
256	2258	1355.78	1476.38	9838.08	16837.86	12555.67	3837.53	97.
257	2259	1257.43	1384.21	9203.33	16436.90	11806.29	3656.51	91.
258	2260	1257.43	1384.21	9203.33	16436.90	11806.29	3656.51	91.
259	2261	1257.43	1384.21	9203.33	16436.90	11806.29	3656.51	91.
260	2262	1257.25	1399.13	9286.14	16493.01	11946.81	3725.01	93.
261	2263	1185.57	1321.79	8721.04	15608.61	11296.18	3456.72	86.
262	2264	1216.71	1352.54	8915.34	16321.87	11568.88	3553.98	89.
263	2265	1251.36	1411.38	9280.84	16785.86	12099.50	3687.01	92.
264	2266	1283.00	1459.01	9583.25	17191.47	12523.92	3822.66	96.
265	2267	1283.00	1459.01	9583.25	17191.47	12523.92	3822.66	96.
266	2268	1283.00	1459.01	9583.25	17191.47	12523.92	3822.66	96.
267	2269	1273.11	1460.54	9568.37	17025.76	12572.30	3806.22	96.
268	2270	1258.47	1460.97	9554.61	17144.79	12576.70	3826.70	98.
269	2271	1241.43	1454.86	9478.60	17120.01	12539.36	3908.53	99.
270	2272	1222.87	1437.15	9337.23	16867.20	12416.86	3810.31	97.
271	2273	1229.82	1437.18	9322.76	16823.01	12442.71	3847.62	98.

272	2274	1229.82	1437.18	9322.76	16823.01	12442.71	3847.62	98.
273	2275	1229.82	1437.18	9322.76	16823.01	12442.71	3847.62	98.
274	2276	1220.51	1439.28	9337.98	16002.12	12492.66	3869.74	99.
275	2277	1221.95	1435.45	9310.10	15957.13	12512.96	3820.35	98.
276	2278	1251.50	1470.07	9531.58	16498.45	12854.39	3924.57	99.
277	2279	1279.45	1498.21	9706.93	16993.96	13120.66	3973.96	100.
278	2280	1285.04	1501.39	9733.17	17180.12	13170.77	4058.73	101.
279	2281	1285.04	1501.39	9733.17	17180.12	13170.77	4058.73	101.
280	2282	1285.04	1501.39	9733.17	17180.12	13170.77	4058.73	101.
281	2283	1285.04	1501.39	9733.17	17180.12	13170.77	4058.73	101.
282	2284	1274.18	1484.23	9629.80	16878.92	13060.34	4090.21	103.
283	2285	1302.50	1515.63	9836.21	17196.43	13344.80	4205.27	107.
284	2286	1463.77	1583.29	10272.07	18050.34	13961.79	4350.28	112.
285	2287	1493.28	1609.14	10439.23	18568.13	14210.16	4384.52	113.
286	2288	1493.28	1609.14	10439.23	18568.13	14210.16	4384.52	113.
287	2289	1493.28	1609.14	10439.23	18568.13	14210.16	4384.52	113.
288	2290	1496.28	1603.60	10412.24	18319.45	14195.34	4368.09	113.
289	2291	1502.62	1606.75	10427.82	18498.87	14248.36	4364.05	111.
290	2292	1530.50	1628.18	10573.77	18954.36	14466.57	4385.99	112.
291	2293	1475.13	1555.02	10122.08	19603.09	13880.21	4201.25	109.
292	2294	1505.26	1576.26	10262.84	19852.86	14087.73	4222.12	110.
293	2295	1505.26	1576.26	10262.84	19852.86	14087.73	4222.12	110.
294	2296	1505.26	1576.26	10262.84	19852.86	14087.73	4222.12	110.
295	2297	1505.26	1576.26	10262.84	19852.86	14087.73	4222.12	110.
296	2298	1547.72	1609.33	10490.29	20715.29	14410.53	4211.24	111.
297	2299	1563.24	1624.86	10544.44	20196.89	14539.10	4240.32	110.
298	2300	1578.78	1634.62	10617.50	20365.30	14639.59	4226.70	109.
299	2301	1563.79	1585.29	10314.45	20508.12	14226.28	4128.21	109.
300	2302	1563.79	1585.29	10314.45	20508.12	14226.28	4128.21	109.
301	2303	1563.79	1585.29	10314.45	20508.12	14226.28	4128.21	109.
302	2304	1570.61	1577.44	10283.96	20731.63	14198.97	4050.29	106.
303	2305	1627.14	1631.11	10639.21	21522.27	14701.49	4100.76	107.
304	2306	1576.69	1567.95	10252.42	20002.54	14175.16	3952.59	104.
305	2307	1703.72	1572.02	10290.66	20283.65	14221.24	3970.40	105.
306	2308	1741.82	1601.68	10496.11	20603.50	14508.23	4017.12	105.
307	2309	1741.82	1601.68	10496.11	20603.50	14508.23	4017.12	105.
308	2310	1741.82	1601.68	10496.11	20603.50	14508.23	4017.12	105.
309	2311	1834.21	1689.05	11086.93	22245.04	15311.49	4169.38	110.
310	2312	1963.58	1721.98	11325.04	22372.73	15638.75	4254.38	113.
311	2313	2007.34	1736.36	11471.75	22625.02	15830.88	4155.73	113.
312	2314	2008.12	1726.39	11417.58	22956.07	15751.78	4125.66	112.
313	2315	1992.73	1694.00	11235.96	23225.54	15474.51	4010.89	110.
314	2316	1992.73	1694.00	11235.96	23225.54	15474.51	4010.89	110.
315	2317	1992.73	1694.00	11235.96	23225.54	15474.51	4010.89	110.
316	2318	2016.78	1702.16	11314.44	23133.92	15570.88	4036.74	109.
317	2319	2025.58	1699.37	11330.39	23628.33	15587.33	3993.18	107.
318	2320	2008.61	1668.53	11158.84	24090.56	15345.20	3864.12	104.
319	2321	1993.37	1641.93	11018.27	23750.31	15146.66	3797.88	101.

320	2322	1980.36	1630.48	10974.04	23234.63	15052.70	3822.21	101.
321	2323	1980.36	1630.48	10974.04	23234.63	15052.70	3822.21	101.
322	2324	1980.36	1630.48	10974.04	23234.63	15052.70	3822.21	101.
323	2325	1870.05	1628.50	10975.15	22745.09	15038.97	3843.87	100.
324	2326	1826.71	1582.84	10692.43	22180.08	14625.55	3750.65	99.
325	2327	1881.25	1629.79	11028.64	22685.50	15078.45	3872.73	101.
326	2328	1881.25	1629.79	11028.64	22685.50	15078.45	3872.73	101.
327	2329	1907.37	1657.90	11259.12	22811.02	15385.45	3979.45	103.
328	2330	1907.37	1657.90	11259.12	22811.02	15385.45	3979.45	103.
329	2331	1907.37	1657.90	11259.12	22811.02	15385.45	3979.45	103.
330	2332	1780.81	1545.71	10545.87	20242.78	14366.18	3792.72	99.
331	2333	1756.75	1514.07	10353.32	19557.31	14096.41	3788.58	99.
332	2334	1745.63	1477.04	10114.71	19484.52	13784.29	3732.21	97.
333	2335	1773.06	1501.94	10287.85	19462.60	14018.97	3888.49	100.
334	2336	1748.25	1476.55	10116.59	19158.50	13785.20	3837.73	98.
335	2337	1748.25	1476.55	10116.59	19158.50	13785.20	3837.73	98.
336	2338	1748.25	1476.55	10116.59	19158.50	13785.20	3837.73	98.
337	2339	1711.64	1425.08	9785.12	18253.66	13322.03	3706.17	94.
338	2340	1718.28	1427.34	9810.74	18248.20	13352.31	3703.50	93.
339	2341	1585.21	1416.11	9748.93	18132.64	13249.96	3687.11	93.
340	2342	1571.02	1402.66	9663.41	17548.01	13128.64	3637.72	92.
341	2343	1753.18	1374.80	9486.49	16750.79	12858.78	3725.28	94.
342	2344	1753.18	1374.80	9486.49	16750.79	12858.78	3725.28	94.
343	2345	1753.18	1374.80	9486.49	16750.79	12858.78	3725.28	94.
344	2346	1765.19	1390.55	9600.79	16991.39	13009.34	3828.13	94.
345	2347	1755.35	1391.26	9595.27	16843.41	12992.85	3908.83	96.
346	2348	1711.64	1339.02	9242.26	16481.05	12500.62	3952.66	96.
347	2349	1710.64	1336.72	9224.41	16253.99	12478.15	3966.43	95.
348	2350	1679.78	1306.06	9013.56	15945.89	12196.47	3881.66	94.
349	2351	1679.78	1306.06	9013.56	15945.89	12196.47	3881.66	94.
350	2352	1679.78	1306.06	9013.56	15945.89	12196.47	3881.66	94.
351	2353	1607.30	1251.50	8627.33	15506.61	11667.63	3832.27	93.
352	2354	1522.63	1181.58	8148.47	14487.69	11011.49	3674.74	89.
353	2355	1488.49	1138.47	7845.52	14372.79	10595.01	3573.34	86.
354	2356	1404.17	1052.96	7241.38	12068.70	9774.40	3470.52	82.
355	2357	1413.19	1073.94	7349.77	11858.80	9933.61	3584.17	85.
356	2358	1413.19	1073.94	7349.77	11858.80	9933.61	3584.17	85.
357	2359	1413.19	1073.94	7349.77	11858.80	9933.61	3584.17	85.
358	2360	1413.19	1073.94	7349.77	11858.80	9933.61	3584.17	85.
359	2361	1344.21	1014.25	6911.10	11191.60	9342.74	3432.25	82.
360	2362	1423.10	1022.86	6920.76	11245.31	9371.46	3483.06	84.
361	2363	1428.34	1028.02	6956.29	11297.31	9418.58	3528.31	85.
362	2364	1535.68	1122.77	7606.33	12015.36	10299.51	3955.77	94.
363	2365	1535.68	1122.77	7606.33	12015.36	10299.51	3955.77	94.
364	3001	1535.68	1122.77	7606.33	12015.36	10299.51	3955.77	94.
365	3002	1503.42	1087.77	7368.41	11549.13	9984.00	3862.82	91.
366	3003	1482.80	1062.96	7196.54	11404.37	9760.94	3768.18	89.
367	3004	1433.86	1014.27	6865.57	11090.47	9315.69	3657.15	87.

368	3005	1428.52	1007.10	6816.45	11058.93	9251.09	3639.34	86.
369	3006	1428.52	1007.10	6816.45	11058.93	9251.09	3639.34	86.
370	3007	1428.52	1007.10	6816.45	11058.93	9251.09	3639.34	86.
371	3008	1420.08	996.48	6742.98	10810.97	9154.90	3594.09	85.
372	3009	1374.06	948.32	6416.90	10370.73	8714.43	3473.70	82.
373	3010	1321.19	904.09	6121.56	9820.12	8302.62	3332.73	79.
374	3011	1321.19	904.09	6121.56	9820.12	8302.62	3332.73	79.
375	3012	1284.48	876.67	5936.23	9508.41	8050.81	3238.09	77.
376	3013	1284.48	876.67	5936.23	9508.41	8050.81	3238.09	77.
377	3014	1284.48	876.67	5936.23	9508.41	8050.81	3238.09	77.
378	3015	1262.36	858.46	5811.16	8871.99	7886.03	3186.03	75.
379	3016	1231.63	822.80	5569.43	8651.03	7567.11	3020.27	70.
380	3017	1190.09	784.63	5311.33	8074.17	7218.04	2891.38	67.
381	3018	1155.19	751.30	5083.63	7766.11	6916.27	2761.24	64.
382	3019	896.19	711.20	4812.68	7116.66	6546.53	2618.90	60.
383	3020	896.19	711.20	4812.68	7116.66	6546.53	2618.90	60.
384	3021	896.19	711.20	4812.68	7116.66	6546.53	2618.90	60.
385	3022	848.98	663.37	4487.52	6441.58	6104.17	2516.08	56.
386	3023	826.60	643.57	4351.91	6309.96	5923.97	2417.40	52.
387	3024	826.60	643.57	4351.91	6309.96	5923.97	2417.40	52.
388	3025	826.60	643.57	4351.91	6309.96	5923.97	2417.40	52.
389	3026	779.80	595.04	4031.59	5991.02	5486.91	2253.18	49.
390	3027	779.80	595.04	4031.59	5991.02	5486.91	2253.18	49.
391	3028	779.80	595.04	4031.59	5991.02	5486.91	2253.18	49.
392	3029	732.51	545.65	3698.74	5548.66	5032.58	2084.83	46.
393	3030	694.61	510.28	3458.61	5085.52	4706.06	1955.99	43.
394	3031	687.41	499.32	3383.73	5054.25	4606.68	1894.35	42.
395	3032	667.62	479.12	3241.93	4890.44	4422.89	1761.88	39.
396	3033	613.04	429.15	2903.75	3886.69	3962.37	1601.46	36.
397	3034	613.04	429.15	2903.75	3886.69	3962.37	1601.46	36.
398	3035	613.04	429.15	2903.75	3886.69	3962.37	1601.46	36.
399	3036	548.87	370.23	2527.63	3427.03	3444.25	1435.48	32.
400	3037	530.86	343.46	2346.50	3219.88	3191.49	1368.28	30.
401	3038	472.97	291.04	1985.93	2512.79	2701.61	1224.25	27.
402	3039	431.29	253.37	1727.88	1690.76	2351.43	1106.36	24.
403	3040	311.93	206.56	1405.55	1443.17	1920.64	867.00	19.
404	3041	311.93	206.56	1405.55	1443.17	1920.64	867.00	19.
405	3042	311.93	206.56	1405.55	1443.17	1920.64	867.00	19.
406	3043	284.73	183.62	1249.64	1347.59	1709.52	743.72	17.
407	3044	151.63	142.75	969.75	1061.59	1327.19	624.46	13.
408	3045	133.18	119.94	812.31	881.02	1113.91	527.20	10.
409	3046	133.18	119.94	812.31	881.02	1113.91	527.20	10.
410	3047	85.72	75.74	514.00	404.86	701.58	398.36	7.
411	3048	85.72	75.74	514.00	404.86	701.58	398.36	7.
412	3049	85.72	75.74	514.00	404.86	701.58	398.36	7.
413	3050	85.72	75.74	514.00	404.86	701.58	398.36	7.

APPENDIX C

SUMMARY OF DAILY STATISTICS OF NARF (AIRFRAME)

DATA FOR JULIAN DATES 1001 TO 2334

TOTAL NUMBER OF OBSERVATIONS = UNKNOWN

DAY	JUL DATE	NORM	DIR LH	DIR L$	DIR M$		OVHD$	P$	I
298	1001	7008.59	7338.91	46058.36	16598.30	1346.94	44322.99	6667.44	72.
299	1002	7008.59	7338.91	46058.36	16598.30	1346.94	44322.99	6667.44	72.
300	1003	7008.59	7338.91	46058.36	16598.30	1346.94	44322.99	6667.44	72.
301	1004	7284.91	7638.68	47954.42	17490.02	1406.79	46173.98	7070.14	75.
302	1005	7397.98	7766.00	48760.82	17741.86	1429.04	46954.72	7164.52	76.
303	1006	7479.64	7847.32	49271.27	17998.01	1451.74	47469.75	7208.28	77.
304	1007	7675.43	8095.80	50872.31	18508.60	1522.95	48948.98	7341.10	79.
305	1008	7642.91	8073.64	50752.18	18401.08	1538.23	48842.38	7318.81	79.
306	1009	7642.91	8073.64	50752.18	18401.08	1538.23	48842.38	7318.81	79.
307	1010	7642.91	8073.64	50752.18	18401.08	1538.23	48842.38	7318.81	79.
308	1011	7886.01	8322.38	52350.99	19551.93	1571.40	50424.11	7445.61	81.
309	1012	7886.01	8322.38	52350.99	19551.93	1571.40	50424.11	7445.61	81.
310	1013	8062.62	8503.96	53500.44	20074.92	1662.71	51541.48	7577.06	83.
311	1014	8162.62	8622.37	54275.99	20346.40	1683.33	52256.59	7624.54	84.
312	1015	8134.81	8594.20	54106.00	20376.73	1675.43	52081.79	7573.92	84.
313	1016	8134.81	8594.20	54106.00	20376.73	1675.43	52081.79	7573.92	84.
314	1017	8134.81	8594.20	54106.00	20376.73	1675.43	52081.79	7573.92	84.
315	1018	8168.79	8655.92	54519.54	20714.69	1711.82	52466.68	7803.59	85.
316	1019	8133.26	8584.44	54120.71	20807.62	1717.51	52039.41	7750.79	84.
317	1020	8079.18	8545.99	53911.10	20835.94	1717.80	51848.25	7684.96	84.
318	1021	8187.75	8662.73	54674.88	21188.23	1727.36	52552.12	7751.01	85.
319	1022	8387.38	8867.47	56007.48	21748.35	1789.30	53821.02	7873.43	87.
320	1023	8387.38	8867.47	56007.48	21748.35	1789.30	53821.02	7873.43	87.
321	1024	8387.38	8867.47	56007.48	21748.35	1789.30	53821.02	7873.43	87.
322	1025	8560.19	9060.73	57263.03	22163.63	1890.25	55022.57	8009.39	88.
323	1026	8694.59	9245.29	58362.83	22832.16	1911.16	56096.57	8138.49	90.
324	1027	8823.16	9389.09	59310.46	23165.39	1940.86	57004.45	8223.83	91.
325	1028	8955.93	9514.56	60142.75	23351.77	1971.28	57777.96	8285.49	92.
326	1029	8972.68	9508.65	60176.38	23428.14	1979.50	57715.32	8090.55	92.
327	1030	8778.03	9290.95	58866.66	22837.89	1927.72	56379.93	7965.96	89.
328	1031	8685.81	9196.00	58286.07	22646.67	1913.93	55782.77	7685.67	88.
329	1032	8816.38	9326.05	59139.32	23100.21	1965.26	56673.51	7928.47	89.

330	1033	8753.86	9262.29	58748.94	22801.33	1955.79	56318.32	7871.46	88.
331	1034	8824.97	9328.63	59170.92	23121.30	1968.11	56735.41	7908.54	89.
332	1035	8982.85	9486.82	60190.92	23689.00	2003.49	57699.37	8016.17	90.
333	1036	9046.85	9550.58	60603.88	23965.82	2015.57	58105.09	8053.25	91.
334	1037	9046.85	9550.58	60603.88	23965.82	2015.57	58105.09	8053.25	91.
335	1038	9046.85	9550.58	60603.88	23965.82	2015.57	58105.09	8053.25	91.
336	1039	8992.63	9514.14	60368.04	23284.87	2004.51	57901.78	8069.09	90.
337	1040	8767.67	9294.43	59022.40	22087.83	1996.90	56580.93	7933.25	88.
338	1041	8831.68	9380.16	59553.55	22253.20	1996.90	57127.61	8027.63	89.
339	1042	9145.57	9711.10	61651.63	23536.08	2064.38	59196.42	8201.90	92.
340	1043	9070.18	9630.39	61157.56	23338.59	2043.13	58703.68	8158.14	91.
341	1044	8859.00	9416.48	59839.27	23058.11	1995.27	57425.57	7978.43	89.
342	1045	8859.00	9416.48	59839.27	23058.11	1995.27	57425.57	7978.43	89.
343	1046	8859.00	9416.48	59839.27	23058.11	1995.27	57425.57	7978.43	89.
344	1047	9091.79	9632.54	61198.99	23754.79	2051.24	58799.21	8116.57	91.
345	1048	9091.79	9632.54	61198.99	23754.79	2051.24	58799.21	8116.57	91.
346	1049	9292.68	9852.84	62612.32	24524.13	2099.96	59956.33	8192.09	93.
347	1050	9292.68	9852.84	62612.32	24524.13	2099.96	59956.33	8192.09	93.
348	1051	8883.61	9427.53	59884.97	23763.12	2002.53	57325.46	7823.61	89.
349	1052	8883.61	9427.53	59884.97	23763.12	2002.53	57325.46	7823.61	89.
350	1053	8993.81	9524.02	60482.16	24178.89	2064.65	57973.02	8081.61	90.
351	1054	8921.75	9445.04	59994.35	23977.34	2033.74	57484.63	8037.85	89.
352	1055	8847.23	9413.07	59768.04	23381.48	2105.04	57412.52	8005.86	89.
353	1056	8858.21	9455.43	60043.20	23446.86	2109.69	57672.93	8056.48	89.
354	1057	9025.98	9611.92	61057.68	23868.59	2128.37	58709.91	8194.61	91.
355	1058	9025.98	9611.92	61057.68	23868.59	2128.37	58709.91	8194.61	91.
356	1059	8810.29	9398.14	59711.26	23346.48	2086.22	57402.66	8005.86	89.
357	1060	8915.95	9507.63	60394.93	23706.55	2112.33	58090.25	8286.15	90.
358	1061	8884.64	9454.72	60036.93	23701.09	2091.91	57789.31	8235.53	90.
359	1062	8974.55	9539.93	60594.60	23850.16	2103.56	58321.53	8315.12	90.
360	1063	9072.99	9613.45	61049.96	24125.98	2124.15	58788.62	8358.88	91.
361	1064	9172.16	9682.13	61617.96	24422.54	2134.66	59357.59	8207.69	92.
362	1065	9172.16	9682.13	61617.96	24422.54	2134.66	59357.59	8207.69	92.
363	1066	9090.49	9600.81	61107.51	24166.39	2111.96	58842.56	8163.93	91.
364	1067	9280.17	9831.70	62537.99	25242.82	2132.08	60310.17	8271.43	93.
365	1068	9291.00	9831.06	62531.81	25335.01	2124.49	60333.31	8271.43	93.
366	1069	9119.06	9640.24	61256.95	24284.40	2149.46	59164.54	8171.39	90.
367	1070	9119.06	9640.24	61256.95	24284.40	2149.46	59164.54	8171.39	90.
368	1071	9186.34	9745.66	61908.30	24549.26	2219.67	59875.09	8161.56	91.
369	1072	8988.65	9516.34	60474.70	24081.57	2180.45	58488.08	7833.80	89.
370	1073	8884.11	9392.05	59684.32	23816.18	2151.98	57745.18	7748.46	88.
371	1074	8995.00	9521.02	60491.82	24197.23	2181.72	58544.05	8028.75	89.
372	1075	8959.73	9474.89	60158.09	24118.87	2175.73	58316.82	7978.13	89.
373	1076	8785.32	9277.57	58915.05	23857.66	2156.49	57141.27	7826.74	87.
374	1077	9069.02	9582.25	60855.18	24797.01	2251.23	59035.74	8033.46	90.
375	1078	9069.02	9582.25	60855.18	24797.01	2251.23	59035.74	8033.46	90.
376	1079	8763.47	9280.47	58944.11	23905.15	2186.08	57158.53	7838.73	86.
377	1080	8763.47	9280.47	58944.11	23905.15	2186.08	57158.53	7838.73	86.

378	1081	8862.17	9395.30	59634.52	24193.53	2218.61	57900.37	7909.66	87.
379	1082	8781.25	9297.43	58984.90	24202.45	2194.29	57341.40	7833.37	86.
380	1083	8650.50	9150.86	58008.33	24153.72	2184.04	56473.43	7699.77	85.
381	1084	8727.42	9246.11	58562.70	24495.23	2196.06	57079.64	7765.81	86.
382	1085	8738.90	9237.17	58496.10	24512.04	2199.49	57013.63	7765.81	86.
383	1086	8398.09	8907.56	56337.41	23489.91	2116.90	54915.86	7562.04	82.
384	1087	8306.84	8783.36	55526.75	23244.71	2074.16	54179.54	7514.56	81.
385	1088	8420.93	8896.02	56216.61	23492.11	2063.56	54894.66	7615.62	82.
386	1089	8127.10	8562.77	54096.59	23062.63	2008.96	52872.96	7177.90	79.
387	1090	7537.41	7921.65	49764.33	21938.63	1820.44	48815.57	6770.99	74.
388	1091	7688.71	8082.79	50744.40	22168.32	1871.66	49824.96	7095.03	76.
389	1092	7686.57	8081.42	50684.25	22072.07	1845.92	49857.19	7095.04	76.
390	1093	7686.57	8081.42	50684.25	22072.07	1845.92	49857.19	7095.04	76.
391	1094	7781.97	8170.55	51249.91	22297.57	1878.83	50384.83	7375.32	77.
392	1095	7867.91	8246.20	51714.16	22355.46	1897.98	50854.06	7419.08	78.
393	1096	7985.55	8379.20	52578.38	22693.50	1938.17	51686.71	7513.46	79.
394	1097	8171.70	8584.80	53983.80	23175.03	1959.52	53086.41	7635.88	81.
395	1098	8171.70	8584.80	53983.80	23175.03	1959.52	53086.41	7635.88	81.
396	1099	8262.83	8641.64	54492.78	23123.12	1969.30	53641.93	7698.93	82.
397	1100	8262.83	8641.64	54492.78	23123.12	1969.30	53641.93	7698.93	82.
398	1101	8262.83	8641.64	54492.78	23123.12	1969.30	53641.93	7698.93	82.
399	1102	8348.77	8713.82	54941.68	23215.40	1996.93	54081.74	7742.69	83.
400	1103	8336.27	8752.23	55213.16	23121.94	1971.84	54295.55	7784.27	83.
401	1104	8294.17	8703.66	54905.21	22621.27	1971.47	53968.51	7779.89	83.
402	1105	8610.00	9069.11	56650.21	23192.86	2051.81	56266.94	8202.03	86.
403	1106	8829.38	9319.54	58336.19	23888.07	2059.31	57942.36	8328.83	88.
404	1107	8829.38	9319.54	58336.19	23888.07	2059.31	57942.36	8328.83	88.
405	1108	8829.38	9319.54	58336.19	23888.07	2059.31	57942.36	8328.83	88.
406	1109	8829.38	9319.54	58336.19	23888.07	2059.31	57942.36	8328.83	88.
407	1110	8835.70	9336.24	58584.03	23818.71	2030.44	58139.65	8127.20	88.
408	1111	8457.93	8894.55	55787.30	22799.27	1887.99	55703.50	7871.19	85.
409	1112	8213.05	8674.24	54395.49	22433.95	1809.12	54366.35	7760.66	83.
410	1113	8386.16	8880.45	55737.54	22911.50	1850.82	55638.50	7883.07	85.
411	1114	8386.16	8880.45	55737.54	22911.50	1850.82	55638.50	7883.07	85.
412	1115	8386.16	8880.45	55737.54	22911.50	1850.82	55638.50	7883.07	85.
413	1116	8386.16	8880.45	55737.54	22911.50	1850.82	55638.50	7883.07	85.
414	1117	8461.20	8966.83	56286.11	23046.17	1827.63	56205.66	7977.45	86.
415	1118	8461.20	8966.83	56286.11	23046.17	1827.63	56205.66	7977.45	86.
416	1119	8469.14	9030.54	56722.57	22888.63	1793.73	56631.00	8057.04	86.
417	1120	8500.29	9055.07	56873.41	22989.68	1776.98	56817.80	8057.04	86.
418	1121	8500.29	9055.07	56873.41	22989.68	1776.98	56817.80	8057.04	86.
419	1122	8500.29	9055.07	56873.41	22989.68	1776.98	56817.80	8057.04	86.
420	1123	8604.07	9155.03	57505.13	23314.59	1781.30	57435.86	8098.50	87.
421	1124	8688.63	9245.05	58125.61	23454.44	1825.89	58038.09	8140.07	87.
422	1125	8694.05	9261.70	58278.40	23266.05	1832.50	58232.45	8140.07	87.
423	1126	8188.86	8700.72	54761.34	21487.82	1631.66	54747.29	7628.37	83.
424	1127	7975.75	8480.15	53362.09	20775.54	1580.46	53397.53	7508.16	81.
425	1128	7975.75	8480.15	53362.09	20775.54	1580.46	53397.53	7508.16	81.

426	1129	7975.75	8480.15	53362.09	20775.54	1580.46	53397.53	7508.16	81.
127	1130	7554.14	8113.24	51056.75	19927.70	1499.65	51265.50	7302.05	79.
128	1131	7774.41	8352.48	52540.37	20483.35	1499.65	52770.02	7667.68	81.
129	1132	7884.28	8479.61	53306.46	20847.69	1496.21	53558.03	7728.42	82.
130	1133	7766.46	8360.07	52567.31	20477.63	1464.25	52798.87	7448.13	81.
131	1134	7973.12	8572.54	53897.13	20793.25	1490.47	54091.95	7577.23	83.
132	1135	7973.12	8572.54	53897.13	20793.25	1490.47	54091.95	7577.23	83.
133	1136	7973.12	8572.54	53897.13	20793.25	1490.47	54091.95	7577.23	83.
134	1137	7973.12	8572.54	53897.13	20793.25	1490.47	54091.95	7577.23	83.
135	1138	8100.54	8738.92	55003.52	21095.16	1466.12	55120.74	7908.14	84.
136	1139	8180.25	8824.38	55528.61	21464.61	1474.41	55615.70	7949.60	85.
137	1140	8098.22	8717.92	54869.45	21221.80	1434.84	54584.38	7889.64	84.
138	1141	8099.96	8718.89	54880.26	21097.88	1436.75	54555.83	7889.63	84.
139	1142	8156.05	8777.74	55363.97	21122.82	1401.04	55013.40	7937.89	84.
140	1143	8156.05	8777.74	55363.97	21122.82	1401.04	55013.40	7937.89	84.
141	1144	8156.05	8777.74	55363.97	21122.82	1401.04	55013.40	7937.89	84.
142	1145	8220.56	8841.80	55754.42	21268.06	1425.50	55381.04	7974.97	85.
143	1146	8234.73	8846.89	55956.31	21048.09	1404.59	55587.74	7974.97	85.
144	1147	8325.20	8934.34	56492.82	21163.14	1426.13	56093.95	8018.73	86.
145	1148	8302.39	8927.40	56446.18	21182.99	1418.93	56028.71	8012.05	86.
146	1149	8512.92	9128.36	57719.24	21525.31	1443.95	57345.09	8141.15	88.
147	1150	8263.53	8861.44	56026.82	20771.37	1360.93	55716.61	7983.86	85.
148	1151	8263.53	8861.44	56026.82	20771.37	1360.93	55716.61	7983.86	85.
149	1152	8263.53	8861.44	56026.82	20771.37	1360.93	55716.61	7983.86	85.
150	1153	8372.68	8978.31	56762.73	21041.67	1360.93	56042.66	8060.88	86.
151	1154	8426.04	9041.77	57148.50	21317.56	1373.08	56432.10	8097.96	87.
152	1155	8440.24	9052.26	57230.73	21451.88	1347.66	56509.84	8094.02	87.
153	1156	8296.15	8892.80	56248.29	21144.29	1311.01	55503.59	7765.47	86.
154	1157	8296.15	8892.80	56248.29	21144.29	1311.01	55503.59	7765.47	86.
155	1158	8296.15	8892.80	56248.29	21144.29	1311.01	55503.59	7765.47	86.
156	1159	8182.65	8792.90	55641.69	21044.21	1274.20	54920.05	7535.80	85.
157	1160	7967.79	8594.27	54418.63	20713.76	1231.43	53687.04	7406.71	83.
158	1161	8261.55	8843.80	55983.11	21380.59	1250.07	54870.68	7571.24	86.
159	1162	8177.18	8739.08	55203.11	21120.91	1272.72	54102.97	7492.58	85.
160	1163	8263.29	8806.63	55596.30	21510.18	1244.15	54563.39	7525.00	86.
161	1164	8263.29	8806.63	55596.30	21510.18	1244.15	54563.39	7525.00	86.
162	1165	8263.29	8806.63	55596.30	21510.18	1244.15	54563.39	7525.00	86.
163	1166	8074.80	8568.29	54060.18	21245.75	1134.50	53199.24	7402.59	84.
164	1167	7881.83	8345.46	52770.27	20610.82	1075.52	51954.02	7248.66	82.
165	1168	7952.00	8418.39	53218.30	20966.45	1101.72	52418.14	7285.74	83.
166	1169	8182.55	8649.66	54667.49	21748.67	1104.25	53950.62	7412.54	85.
167	1170	8103.76	8555.18	54070.62	21552.64	1063.91	53374.07	7365.06	84.
168	1171	8103.76	8555.18	54070.62	21552.64	1063.91	53374.07	7365.06	84.
169	1172	8005.30	8447.44	53416.68	21210.14	1027.95	52786.11	7334.78	82.
170	1173	7976.34	8401.54	53002.55	21147.18	1027.95	52425.40	7293.20	82.
171	1174	7737.93	8187.99	51652.78	20648.26	984.24	51090.80	7155.06	80.
172	1175	7490.96	7906.06	49856.46	20021.66	853.75	49382.63	6751.43	78.
173	1176	7429.54	7849.20	49315.96	19981.91	849.43	48931.57	6709.97	77.

174	1177	7429.54	7849.20	49315.96	19981.91	849.43	48931.57	6709.97	77.
175	1178	7310.42	7709.95	48298.95	19704.04	849.43	47949.64	6624.63	76.
176	1179	7323.15	7727.82	48362.41	19895.09	839.09	48136.06	6629.01	76.
177	1180	7146.80	7511.78	46946.43	19958.71	764.54	46752.43	6528.73	74.
178	1181	6363.67	6684.79	41581.35	18269.16	466.67	41806.05	5903.10	67.
179	1182	6573.40	6906.48	43048.56	18672.67	466.67	43359.05	6054.49	69.
180	1183	6731.57	7094.82	44245.71	19067.28	466.67	44664.65	6183.59	71.
181	1184	6731.57	7094.82	44245.71	19067.28	466.67	44664.65	6183.59	71.
182	1185	6731.57	7094.82	44245.71	19067.28	466.67	44664.65	6183.59	71.
183	1186	6731.57	7094.82	44245.71	19067.28	466.67	44664.65	6183.59	71.
184	1187	6903.25	7304.93	45600.35	19443.31	466.67	46122.43	6312.68	73.
185	1188	7098.30	7522.93	46960.17	19935.14	466.67	47644.32	6435.10	75.
186	1189	7167.86	7577.73	47306.34	20160.68	466.67	48020.16	6472.18	76.
187	1190	7255.89	7690.25	48011.33	20328.10	466.67	48775.42	6549.20	77.
188	1191	7255.89	7690.25	48011.33	20328.10	466.67	48775.42	6549.20	77.
189	1192	7255.89	7690.25	48011.33	20328.10	466.67	48775.42	6549.20	77.
190	1193	7480.11	7898.19	48802.46	20809.35	466.67	50213.93	6685.04	79.
191	1194	7601.87	8014.20	49590.42	20836.18	458.04	51090.80	6772.67	80.
192	1195	7703.79	8109.09	50203.11	21186.47	458.04	51772.02	6814.13	81.
193	1196	7835.69	8217.98	50913.19	21385.93	446.68	52584.73	6877.18	82.
194	1197	7730.04	8104.65	50214.09	21121.51	419.82	51890.51	6596.89	81.
195	1198	7730.04	8104.65	50214.09	21121.51	419.82	51890.51	6596.89	81.
196	1199	7730.04	8104.65	50214.09	21121.51	419.82	51890.51	6596.89	81.
197	1200	7908.49	8277.81	51354.89	21454.89	396.24	53156.33	6943.23	83.
198	1201	8125.24	8469.59	52574.50	21913.65	396.24	54473.59	7080.21	85.
199	1202	8209.61	8548.82	53079.97	22120.20	396.24	55032.72	7123.97	86.
200	1203	8432.80	8763.60	54439.22	22661.16	396.24	56506.68	7246.39	88.
201	1204	8520.96	8842.70	54964.61	22951.29	396.24	57167.08	7482.79	89.
202	1205	8520.96	8842.70	54964.61	22951.29	396.24	57167.08	7482.79	89.
203	1206	8520.96	8842.70	54964.61	22951.29	396.24	57167.08	7482.79	89.
204	1207	8378.36	8704.91	54116.27	22751.22	345.56	56362.80	7401.95	87.
205	1208	8315.64	8675.01	53984.05	22715.61	291.40	56444.86	7399.77	86.
206	1209	8246.79	8613.40	53610.18	22441.57	276.60	56086.84	7362.69	85.
207	1210	8017.92	8376.14	52123.16	21879.28	213.86	54725.58	7008.04	83.
208	1211	8144.84	8491.09	52873.86	22169.41	213.86	55520.91	7288.33	84.
209	1212	8144.84	8491.09	52873.86	22169.41	213.86	55520.91	7288.33	84.
210	1213	8144.84	8491.09	52873.86	22169.41	213.86	55520.91	7288.33	84.
211	1214	8144.84	8491.09	52873.86	22169.41	213.86	55520.91	7288.33	84.
212	1215	8063.88	8430.93	52542.93	21794.32	197.94	55259.48	7226.94	83.
213	1216	7997.21	8355.52	52063.58	21462.20	181.50	54796.95	7189.86	82.
214	1217	8125.63	8501.37	53015.80	21779.74	181.50	55884.39	7266.88	83.
215	1218	8046.36	8438.36	52637.14	21533.13	111.03	55595.90	7229.79	82.
216	1219	8046.36	8438.36	52637.14	21533.13	111.03	55595.90	7229.79	82.
217	1220	8046.36	8438.36	52637.14	21533.13	111.03	55595.90	7229.79	82.
218	1221	8060.19	8459.97	52758.55	21579.25	69.60	55829.81	7466.32	82.
219	1222	8327.52	8744.91	54597.05	22173.91	69.60	57819.14	7637.95	85.
220	1223	8327.52	8744.91	54597.05	22173.91	69.60	57819.14	7637.95	85.
221	1224	8497.77	8958.86	55954.61	22545.02	69.60	59282.57	7758.73	87.

222	1225	8414.90	8892.73	55577.61	22212.41	24.76	58922.52	7714.97	86.
223	1226	8414.90	8892.73	55577.61	22212.41	24.76	58922.52	7714.97	86.
224	1227	8414.90	8892.73	55577.61	22212.41	24.76	58922.52	7714.97	86.
225	1228	8532.93	9022.54	56393.14	22637.68	24.76	59830.39	7833.45	88.
226	1229	8635.89	9140.56	57184.40	22840.14	24.76	60689.59	7910.46	89.
227	1230	8440.63	8951.23	55988.70	22225.95	24.76	59528.63	7588.60	88.
228	1231	8487.49	8995.77	56333.36	22324.04	22.23	59885.73	7650.27	89.
229	1232	8583.08	9078.78	56843.85	22559.76	22.23	60459.15	7691.72	90.
230	1233	8583.08	9078.78	56843.85	22559.76	22.23	60459.15	7691.72	90.
231	1234	8583.08	9078.78	56843.85	22559.76	22.23	60459.15	7691.72	90.
232	1235	8327.02	8831.56	55342.60	21480.87	22.23	58914.85	7548.13	87.
233	1236	8313.42	8827.02	55305.48	21202.62	0.0	58910.14	7548.13	87.
234	1237	7957.64	8451.45	52926.01	20018.55	0.0	56413.48	7283.07	84.
235	1238	7975.84	8499.47	53253.77	19820.20	0.0	56743.16	7598.92	85.
236	1239	8117.67	8645.78	54183.60	20201.21	0.0	57789.18	7719.70	87.
237	1240	8117.67	8645.78	54183.60	20201.21	0.0	57789.18	7719.70	87.
238	1241	8117.67	8645.78	54183.60	20201.21	0.0	57789.18	7719.70	87.
239	1242	8202.79	8762.73	54948.98	20549.93	0.0	58648.05	8017.77	89.
240	1243	8219.05	8781.89	55108.94	20540.13	0.0	58973.38	7789.92	89.
241	1244	8292.29	8861.84	55599.51	20761.84	0.0	59508.35	7833.68	90.
242	1245	8381.02	8961.84	56236.78	21040.14	0.0	60174.09	7919.02	91.
243	1246	8585.96	9183.24	57658.57	21431.24	0.0	61661.00	8053.56	93.
244	1247	8484.04	9088.36	57045.88	21080.96	0.0	60979.79	8012.10	92.
245	1248	8484.04	9088.36	57045.88	21080.96	0.0	60979.79	8012.10	92.
246	1249	8484.04	9088.36	57045.88	21080.96	0.0	60979.79	8012.10	92.
247	1250	8507.56	9095.06	57104.71	21148.48	0.0	61001.95	8049.74	92.
248	1251	8345.66	8932.84	56057.13	20779.67	0.0	59908.09	7920.52	91.
249	1252	8287.04	8900.95	55849.05	20736.01	0.0	59685.76	7940.85	92.
250	1253	8288.29	8899.10	55794.70	20841.96	0.0	59691.02	8170.52	93.
251	1254	8288.29	8899.10	55794.70	20841.96	0.0	59691.02	8170.52	93.
252	1255	8288.29	8899.10	55794.70	20841.96	0.0	59691.02	8170.52	93.
253	1256	8191.79	8800.78	55160.32	20541.66	0.0	59024.29	8118.44	92.
254	1257	7924.00	8522.98	53408.72	20028.07	0.0	57096.17	7967.05	90.
255	1258	7878.52	8486.00	53175.24	19935.65	0.0	56812.39	7962.67	90.
256	1259	7794.31	8394.71	52598.59	19779.82	0.0	56191.76	7877.33	89.
257	1260	7968.46	8595.48	53857.30	20375.41	0.0	57526.36	8004.13	91.
258	1261	7808.54	8397.38	52569.58	19829.73	0.0	56130.39	7923.29	89.
259	1262	7808.54	8397.38	52569.58	19829.73	0.0	56130.39	7923.29	89.
260	1263	7897.48	8515.05	53287.59	20154.42	0.0	56954.05	7958.73	90.
261	1264	7818.76	8449.33	52852.74	20048.49	0.0	56495.81	7895.67	89.
262	1265	7764.34	8413.65	52615.21	19724.38	0.0	56219.16	7891.29	89.
263	1266	7604.78	8251.29	51531.98	19388.82	0.0	55040.57	7816.67	87.
264	1267	7832.68	8531.10	53297.41	20277.97	0.0	57008.56	7982.85	90.
265	1268	7528.71	8232.50	51397.67	19574.94	0.0	55018.77	7759.37	87.
266	1269	7528.71	8232.50	51397.67	19574.94	0.0	55018.77	7759.37	87.
267	1270	7814.54	8532.26	53304.50	20129.94	0.0	57130.71	7950.49	90.
268	1271	7797.50	8502.95	53081.50	20218.14	0.0	56907.29	7950.49	90.
269	1272	7734.32	8447.82	52675.14	19922.04	0.0	56112.99	7896.05	89.

270	1273	7152.08	7791.00	48938.30	18766.04	0.0	51662.33	7413.27	84.
271	1274	7424.30	8103.16	50923.27	19441.84	0.0	53839.66	7606.11	87.
272	1275	7424.30	8103.16	50923.27	19441.84	0.0	53839.66	7606.11	87.
273	1276	7424.30	8103.16	50923.27	19441.84	0.0	53839.66	7606.11	87.
274	1277	7442.39	8093.71	50879.41	19410.55	0.0	53869.19	7656.73	87.
275	1278	7578.09	8259.48	51925.19	19704.53	0.0	55015.63	7794.87	89.
276	1279	7578.09	8259.48	51925.19	19704.53	0.0	55015.63	7794.87	89.
277	1280	7663.46	8361.89	52548.52	19850.35	0.0	55698.71	7880.21	90.
278	1281	7663.46	8361.89	52548.52	19850.35	0.0	55698.71	7880.21	90.
279	1282	7663.46	8361.89	52548.52	19850.35	0.0	55698.71	7880.21	90.
280	1283	7663.46	8361.89	52548.52	19850.35	0.0	55698.71	7880.21	90.
281	1284	7663.46	8361.89	52548.52	19850.35	0.0	55698.71	7880.21	90.
282	1285	7748.94	8435.57	53001.61	20153.22	0.0	56211.88	7921.66	91.
283	1286	7622.94	8317.95	52259.18	19911.34	0.0	55412.95	7836.33	90.
284	1287	7798.72	8528.50	53600.63	20342.01	0.0	56955.50	7946.14	92.
285	1288	7824.91	8555.36	53793.35	20170.59	0.0	57143.59	7990.02	92.
286	1289	7824.91	8555.36	53793.35	20170.59	0.0	57143.59	7990.02	92.
287	1290	7824.91	8555.36	53793.35	20170.59	0.0	57143.59	7990.02	92.
288	1291	7981.82	8726.21	54885.66	20743.04	0.0	58371.95	8307.38	94.
289	1292	8089.39	8853.21	55701.41	20949.25	0.0	59282.99	8392.72	95.
290	1293	8170.64	8949.50	56309.08	21109.69	0.0	59992.60	8436.48	96.
291	1294	8117.12	8906.72	56088.39	20884.73	0.0	59718.63	8189.45	95.
292	1295	8062.20	8852.79	55754.47	20778.87	0.0	59869.80	8149.51	95.
293	1296	8062.20	8852.79	55754.47	20778.87	0.0	59869.80	8149.51	95.
294	1297	8062.20	8852.79	55754.47	20778.87	0.0	59869.80	8149.51	95.
295	1298	8062.20	8852.79	55754.47	20778.87	0.0	59869.80	8149.51	95.
296	1299	8143.45	8939.96	56296.32	20942.42	0.0	60513.31	8193.27	96.
297	1300	8157.13	8961.76	56457.12	20955.63	0.0	60800.07	8208.82	96.
298	1301	8265.29	9060.51	57062.28	21312.02	0.0	61520.85	8250.27	97.
299	1302	8394.24	9198.40	57937.59	21378.29	0.0	62504.91	8327.29	98.
300	1303	8394.24	9198.40	57937.59	21378.29	0.0	62504.91	8327.29	98.
301	1304	8394.24	9198.40	57937.59	21378.29	0.0	62504.91	8327.29	98.
302	1305	8394.45	9202.61	57989.25	21694.30	0.0	62012.84	8329.59	98.
303	1306	8297.22	9089.86	57265.34	21434.32	0.0	61283.98	8235.22	97.
304	1307	8281.92	9071.28	57164.64	21537.46	0.0	61260.00	8195.27	97.
305	1308	8201.79	8965.14	56479.37	21310.05	0.0	60598.95	7897.63	96.
306	1309	8293.21	9071.55	57182.30	21591.27	0.0	61524.24	7930.77	97.
307	1310	8293.21	9071.55	57182.30	21591.27	0.0	61524.24	7930.77	97.
308	1311	8293.21	9071.55	57182.30	21591.27	0.0	61524.24	7930.77	97.
309	1312	8099.65	8860.45	55852.73	20952.70	0.0	60105.18	7812.29	95.
310	1313	8262.15	9027.08	56868.91	21288.37	0.0	61316.81	7941.39	97.
311	1314	8354.14	9127.00	57508.05	21615.55	0.0	62071.53	8221.68	98.
312	1315	8340.34	9122.03	57476.36	21504.08	0.0	62166.44	8011.73	98.
313	1316	8071.30	8844.76	55711.39	20511.90	0.0	60293.22	7843.48	95.
314	1317	8071.30	8844.76	55711.39	20511.90	0.0	60293.22	7843.48	95.
315	1318	8071.30	8844.76	55711.39	20511.90	0.0	60293.22	7843.48	95.
316	1319	8192.33	8964.73	56454.31	20545.36	0.0	61287.43	7927.58	95.
317	1320	8038.18	8809.45	55498.51	20006.95	0.0	60239.39	7840.06	93.

318	1321	8031.11	8811.27	55485.79	20157.05	0.0	60359.18	7815.47	93.
319	1322	8152.00	8938.92	56300.70	20386.63	0.0	61301.13	7892.49	94.
320	1323	8154.16	8914.17	56136.59	20339.79	0.0	61213.30	7655.97	94.
321	1324	8154.16	8914.17	56136.59	20339.79	0.0	61213.30	7655.97	94.
322	1325	8154.16	8914.17	56136.59	20339.79	0.0	61213.30	7655.97	94.
323	1326	8410.30	9156.56	57658.74	21041.66	0.0	63049.55	7811.52	97.
324	1327	8510.30	9260.59	58308.45	21400.70	0.0	63878.52	7852.98	98.
325	1328	8579.29	9330.73	58732.27	21523.05	0.0	64529.99	7896.74	99.
326	1329	8579.29	9330.73	58732.27	21523.05	0.0	64529.99	7896.74	99.
327	1330	8433.56	9149.18	57589.56	21175.71	0.0	63340.76	7736.32	97.
328	1331	8433.56	9149.18	57589.56	21175.71	0.0	63340.76	7736.32	97.
329	1332	8433.56	9149.18	57589.56	21175.71	0.0	63340.76	7736.32	97.
330	1333	8556.65	9280.79	58447.28	21429.28	0.0	64392.38	7813.34	98.
331	1334	8417.38	9120.37	57470.03	21056.08	0.0	63390.60	7495.97	96.
332	1335	8393.00	9081.08	57230.79	21026.86	0.0	63117.32	7469.86	95.
333	1336	8171.92	8861.72	55876.33	20175.75	0.0	61616.52	7343.18	92.
334	1337	8059.23	8699.85	54814.37	20042.34	0.0	60565.46	7252.55	91.
335	1338	8059.23	8699.85	54814.37	20042.34	0.0	60565.46	7252.55	91.
336	1339	8059.23	8699.85	54814.37	20042.34	0.0	60565.46	7252.55	91.
337	1340	7993.20	8568.78	54005.76	19937.79	0.0	59753.45	7242.29	91.
338	1341	7967.57	8583.00	54095.62	19852.97	0.0	59982.11	7242.29	91.
339	1342	8164.48	8786.81	55405.59	20245.36	0.0	61453.49	7363.07	93.
340	1343	8227.78	8805.34	55576.19	20444.01	0.0	61663.95	7603.98	93.
341	1344	8291.49	8858.02	55928.70	20641.66	0.0	62117.22	7647.74	94.
342	1345	8291.49	8858.02	55928.70	20641.66	0.0	62117.22	7647.74	94.
343	1346	8291.49	8858.02	55928.70	20641.66	0.0	62117.22	7647.74	94.
344	1347	8169.30	8715.84	55040.18	20005.86	0.0	61162.52	7332.67	92.
345	1348	8145.56	8646.79	54584.70	20136.74	0.0	60731.25	7297.12	92.
346	1349	8267.33	8773.24	55399.08	20398.43	0.0	61604.64	7391.50	93.
347	1350	8039.33	8530.70	53889.61	19537.11	0.0	59882.46	7260.32	91.
348	1351	8098.89	8504.39	53754.55	19435.98	0.0	59575.71	7312.30	91.
349	1352	8098.89	8504.39	53754.55	19435.98	0.0	59575.71	7312.30	91.
350	1353	8098.89	8504.39	53754.55	19435.98	0.0	59575.71	7312.30	91.
351	1354	8119.30	8510.31	53790.00	19439.43	0.0	59581.25	7318.98	91.
352	1355	8170.82	8562.26	54119.12	19535.70	0.0	59915.61	7367.23	91.
353	1356	8043.77	8416.81	53222.80	19232.46	0.0	59341.89	7290.21	90.
354	1357	7916.24	8247.20	52161.67	19120.02	0.0	58131.61	6768.92	88.
355	1358	7601.86	7890.00	49850.84	18457.82	0.0	55537.97	6532.20	85.
356	1359	7601.86	7890.00	49850.84	18457.82	0.0	55537.97	6532.20	85.
357	1360	7601.86	7890.00	49850.84	18457.82	0.0	55537.97	6532.20	85.
358	1361	7658.24	7939.24	50188.84	18648.80	0.0	55884.05	6575.96	86.
359	1362	7770.22	8056.81	50969.52	18996.31	0.0	56642.41	6639.01	87.
360	1363	7497.50	7763.81	49101.22	17870.60	0.0	54965.68	6564.47	85.
361	1364	6744.36	6858.00	43212.05	16339.41	0.0	48961.57	5884.73	77.
362	1365	6744.36	6858.00	43212.05	16339.41	0.0	48961.57	5884.73	77.
363	2001	6702.16	6815.47	42948.27	16229.21	0.0	48681.99	5833.09	76.
364	2002	6702.16	6815.47	42948.27	16229.21	0.0	48681.99	5833.09	76.
365	2003	6901.64	7033.89	44410.55	16900.60	0.0	50173.68	6207.76	78.

366	2004	6950.87	7086.97	44755.03	17080.51	0.0	50526.59	6244.84	79.
367	2005	7036.80	7159.67	45233.76	17382.95	0.0	51018.34	6286.29	80.
368	2006	7118.34	7238.10	45743.57	17643.61	0.0	51545.46	6330.05	81.
369	2007	7490.83	7614.02	48241.63	18531.16	0.0	54130.00	6628.61	85.
370	2008	7490.83	7614.02	48241.63	18531.16	0.0	54130.00	6628.61	85.
371	2009	7490.83	7614.02	48241.63	18531.16	0.0	54130.00	6628.61	85.
372	2010	7611.41	7752.95	49160.45	18696.11	0.0	54736.97	6713.95	86.
373	2011	7696.13	7827.22	49660.02	18971.30	0.0	55244.95	6757.71	87.
374	2012	7928.16	8076.89	51321.09	19605.00	0.0	57017.30	6893.55	89.
375	2013	7994.83	8157.79	51858.23	20214.62	0.0	57582.93	6930.63	90.
376	2014	8100.18	8268.36	52600.62	20438.14	0.0	58338.53	7025.00	91.
377	2015	8100.18	8268.36	52600.62	20438.14	0.0	58338.53	7025.00	91.
378	2016	8100.18	8268.36	52600.62	20438.14	0.0	58338.53	7025.00	91.
379	2017	8189.89	8343.29	53117.51	20727.54	0.0	58861.23	7068.76	92.
380	2018	8406.52	8566.36	54625.77	21195.41	0.0	60416.69	7197.86	94.
381	2019	8510.80	8668.64	55315.21	21570.56	0.0	61168.67	7239.32	95.
382	2020	8449.27	8589.95	54828.27	21321.41	0.0	60546.25	7202.24	94.
383	2021	8525.03	8666.29	55413.30	21535.99	0.0	61049.62	7274.32	95.
384	2022	8525.03	8666.29	55413.30	21535.99	0.0	61049.62	7274.32	95.
385	2023	8525.03	8666.29	55413.30	21535.99	0.0	61049.62	7274.32	95.
386	2024	8661.72	8789.83	56275.69	21818.16	0.0	61931.16	7425.71	97.
387	2025	8924.49	9055.89	58154.99	22439.92	0.0	63164.04	7594.80	99.
388	2026	9037.62	9157.93	58903.41	22713.58	0.0	63907.77	7875.09	100.
389	2027	9132.24	9225.95	59435.59	22864.18	0.0	64277.67	7971.77	101.
390	2028	9304.68	9403.92	60647.27	23348.54	0.0	65531.61	8103.23	103.
391	2029	9304.68	9403.92	60647.27	23348.54	0.0	65531.61	8103.23	103.
392	2030	9304.68	9403.92	60647.27	23348.54	0.0	65531.61	8103.23	103.
393	2031	9253.66	9338.53	60342.29	23421.01	0.0	65012.25	8059.47	102.
394	2032	9397.52	9497.74	61482.62	23649.92	0.0	66154.13	8144.81	103.
395	2033	9385.71	9473.23	61361.00	23762.66	0.0	65986.81	8111.55	103.
396	2034	9565.32	9646.02	62534.91	24305.78	0.0	67225.25	8247.38	105.
397	2035	9647.34	9710.94	62978.11	24697.67	0.0	67693.75	8284.46	106.
398	2036	9647.34	9710.94	62978.11	24697.67	0.0	67693.75	8284.46	106.
399	2037	9647.34	9710.94	62978.11	24697.67	0.0	67693.75	8284.46	106.
400	2038	9604.48	9673.32	62884.61	24532.21	0.0	67345.94	8251.32	105.
401	2039	9895.83	9963.14	64901.35	25229.28	0.0	69393.25	8439.79	108.
402	2040	9875.46	9951.93	64862.84	25239.46	0.0	69303.06	8457.15	108.
403	2041	9880.02	9967.14	65040.87	25361.47	0.0	69369.94	8450.46	108.
404	2042	9886.46	9962.95	65035.84	25363.07	0.0	69304.06	8450.46	108.
405	2043	9886.46	9962.95	65035.84	25363.07	0.0	69304.06	8450.46	108.
406	2044	9886.46	9962.95	65035.84	25363.07	0.0	69304.06	8450.46	108.
407	2045	9935.07	*******	65401.82	25382.25	0.0	69609.75	8450.46	108.
408	2046	9661.24	9729.50	63656.22	24614.97	0.0	67573.06	8265.94	105.
409	2047	9829.30	9908.48	64942.53	24779.14	0.0	68835.50	8590.11	106.
410	2048	*******	*******	66550.81	25688.01	0.0	70585.13	8675.32	108.
411	2049	*******	*******	67038.06	25713.96	0.0	71046.56	8716.91	108.
412	2050	*******	*******	67038.06	25713.96	0.0	71046.56	8716.91	108.
413	2051	*******	*******	67038.06	25713.96	0.0	71046.56	8716.91	108.

414	2052	*******	*******	67038.06	25713.96	0.0	71046.56	8716.91	108.
415	2053	*******	*******	66810.75	25803.21	0.0	70747.94	8686.50	107.
416	2054	*******	*******	66938.75	25743.80	0.0	70771.06	8686.51	107.
417	2055	*******	*******	68233.63	26335.09	0.0	72152.88	8794.02	109.
418	2056	*******	*******	70645.00	27056.47	0.0	74650.75	9439.93	112.
419	2057	*******	*******	69990.56	26880.25	0.0	73939.19	9362.91	111.
420	2058	*******	*******	69341.25	26560.40	0.0	73219.50	9082.63	110.
421	2059	*******	*******	69486.13	26608.79	0.0	73382.13	9089.31	110.
422	2060	*******	*******	68317.19	25970.48	0.0	71969.56	8960.34	107.
423	2061	*******	*******	68956.88	26404.70	0.0	72683.56	9001.79	108.
424	2062	*******	*******	69747.88	26638.33	0.0	73527.75	9087.13	109.
425	2063	*******	*******	68160.25	26320.43	0.0	71683.50	8924.77	107.
426	2064	*******	*******	68160.25	26320.43	0.0	71683.50	8924.77	107.
427	2065	*******	*******	68160.25	26320.43	0.0	71683.50	8924.77	107.
428	2066	*******	*******	70517.25	27069.35	0.0	74088.88	9312.68	109.
429	2067	*******	*******	71029.00	27382.61	0.0	74655.38	9354.14	110.
430	2068	*******	*******	71429.88	27194.48	0.0	75055.63	9398.02	110.
431	2069	*******	*******	72033.19	27414.40	0.0	75715.00	9446.29	110.
432	2070	*******	*******	72033.19	27414.40	0.0	75715.00	9446.29	110.
433	2071	*******	*******	70954.25	26795.03	0.0	74537.13	9361.07	108.
434	2072	*******	*******	70338.25	26636.14	0.0	74263.31	9284.05	107.
435	2073	*******	*******	70920.88	26651.70	0.0	74676.13	9332.31	107.
436	2074	*******	*******	70920.88	26651.70	0.0	74676.13	9332.31	107.
437	2075	*******	*******	72020.56	27184.54	0.0	75851.56	9429.57	109.
438	2076	*******	*******	69989.00	25929.05	0.0	73593.63	9274.01	106.
439	2077	*******	*******	69880.88	25873.52	0.0	73485.00	9267.33	106.
440	2078	*******	*******	68129.88	25446.05	0.0	71989.25	9096.66	104.
441	2079	*******	*******	68129.88	25446.05	0.0	71989.25	9096.66	104.
442	2080	*******	*******	67693.63	24894.78	0.0	71485.25	8630.47	103.
443	2081	9968.62	9978.07	66816.75	24802.58	0.0	70571.31	8526.93	102.
444	2082	9841.85	9843.69	65885.38	24422.70	0.0	69629.38	8421.26	100.
445	2083	9739.39	9773.64	65446.80	24267.63	0.0	69153.69	8394.86	99.
446	2084	9935.91	9974.78	66831.75	24725.95	0.0	70538.50	8548.79	101.
447	2085	9846.21	9899.86	66314.94	24436.56	0.0	70015.81	8505.03	100.
448	2086	9846.21	9899.86	66314.94	24436.56	0.0	70015.81	8505.03	100.
449	2087	9695.75	9733.99	65169.09	23983.23	0.0	68858.94	8419.69	99.
450	2088	9316.29	9414.37	63057.47	22974.23	0.0	66596.69	8470.55	95.
451	2089	8698.70	8755.44	58679.11	21552.71	0.0	61857.75	8038.32	89.
452	2090	8045.02	8125.38	54419.07	19576.93	0.0	57215.85	7481.70	83.
453	2091	7890.33	7968.82	53636.36	19232.72	0.0	56239.44	7413.00	82.
454	2092	7890.33	7968.82	53636.36	19232.72	0.0	56239.44	7413.00	82.
455	2093	7890.33	7968.82	53636.36	19232.72	0.0	56239.44	7413.00	82.
456	2094	7970.33	8042.33	54152.15	19711.36	0.0	56776.52	7456.76	83.
457	2095	7882.75	7941.48	53443.71	19617.36	0.0	56082.89	7408.50	83.
458	2096	7882.75	7941.48	53443.71	19617.36	0.0	56082.89	7408.50	83.
459	2097	8099.73	8169.30	54992.27	20467.37	0.0	57738.82	7535.30	85.
460	2098	7965.49	8032.34	54055.63	20249.20	0.0	57370.61	7458.29	84.
461	2099	7965.49	8032.34	54055.63	20249.20	0.0	57370.61	7458.29	84.

462	2100	7965.49	8032.34	54055.63	20249.20	0.0	57370.61	7458.29	84.
463	2101	8045.49	8105.48	54569.30	20733.69	0.0	57874.54	7502.04	85.
464	2102	8265.34	8330.24	56104.21	21322.08	0.0	59416.48	7867.67	87.
465	2103	8422.95	8475.39	57113.02	22021.81	0.0	60424.59	7977.48	89.
466	2104	8482.95	8540.58	57570.02	22297.93	0.0	60902.60	8014.55	90.
467	2105	8533.70	8601.49	57990.18	22489.43	0.0	61335.42	8051.63	91.
468	2106	8533.70	8601.49	57990.18	22489.43	0.0	61335.42	8051.63	91.
469	2107	8533.70	8601.49	57990.18	22489.43	0.0	61335.42	8051.63	91.
470	2108	8286.87	8335.60	56168.07	22141.33	0.0	59471.50	7880.95	89.
471	2109	8476.31	8528.73	57508.16	22989.73	0.0	60857.95	8005.45	91.
472	2110	8476.31	8528.73	57508.16	22989.73	0.0	60857.95	8005.45	91.
473	2111	8637.52	8696.59	58654.34	23526.62	0.0	62061.08	8127.86	93.
474	2112	8637.52	8696.59	58654.34	23526.62	0.0	62061.08	8127.86	93.
475	2113	8637.52	8696.59	58654.34	23526.62	0.0	62061.08	8127.86	93.
476	2114	8637.52	8696.59	58654.34	23526.62	0.0	62061.08	8127.86	93.
477	2115	8887.16	8977.53	60621.58	24726.57	0.0	64010.29	8491.19	95.
478	2116	8634.21	8731.51	58971.17	24125.70	0.0	62279.90	8325.01	92.
479	2117	8614.70	8722.46	58926.45	24416.34	0.0	62168.59	8334.05	92.
480	2118	8614.70	8722.46	58926.45	24416.34	0.0	62168.59	8334.05	92.
481	2119	8513.10	8624.10	58312.37	24059.23	0.0	61329.17	8319.72	91.
482	2120	8513.10	8624.10	58312.37	24059.23	0.0	61329.17	8319.72	91.
483	2121	8513.10	8624.10	58312.37	24059.23	0.0	61329.17	8319.72	91.
484	2122	8431.94	8554.78	57848.92	23759.10	0.0	60830.26	8275.96	90.
485	2123	8535.39	8660.47	58580.55	24273.22	0.0	61598.84	8317.42	91.
486	2124	8630.02	8761.42	59265.06	24533.12	0.0	62301.17	8411.80	92.
487	2125	8651.83	8799.18	59505.48	24703.46	0.0	62535.40	8216.86	92.
488	2126	8567.56	8714.65	58941.15	24374.56	0.0	61934.00	7936.57	91.
489	2127	8567.56	8714.65	58941.15	24374.56	0.0	61934.00	7936.57	91.
490	2128	8567.56	8714.65	58941.15	24374.56	0.0	61934.00	7936.57	91.
491	2129	8631.71	8793.57	59487.37	24591.56	0.0	62457.09	7973.64	92.
492	2130	8514.10	8677.78	58742.95	24397.70	0.0	61640.54	7896.63	91.
493	2131	8539.00	8711.29	59045.09	24563.92	0.0	61889.05	7924.66	92.
494	2132	8452.18	8628.14	58072.96	24222.89	0.0	60810.34	7883.21	91.
495	2133	8308.63	8484.17	57103.28	24103.64	0.0	59769.46	7797.87	90.
496	2134	8218.49	8407.72	56593.66	23785.45	0.0	59207.01	7754.11	89.
497	2135	8218.49	8407.72	56593.66	23785.45	0.0	59207.01	7754.11	89.
498	2136	8095.52	8289.27	55802.63	23551.82	0.0	58362.82	7668.77	88.
499	2137	8322.29	8530.36	57506.50	24446.18	0.0	59935.90	7821.68	91.
500	2138	8197.29	8403.67	56653.85	24201.27	0.0	59027.38	7736.34	90.
501	2139	8282.40	8506.77	57308.81	24393.30	0.0	59653.85	7817.30	91.
502	2140	8151.94	8363.04	56360.27	24130.42	0.0	58663.30	7722.92	90.
503	2141	8151.94	8363.04	56360.27	24130.42	0.0	58663.30	7722.92	90.
504	2142	8151.94	8363.04	56360.27	24130.42	0.0	58663.30	7722.92	90.
505	2143	8108.15	8346.89	56201.80	24059.34	0.0	58491.21	7527.97	90.
506	2144	8108.15	8346.89	56201.80	24059.34	0.0	58491.21	7527.97	90.
507	2145	8026.96	8283.42	55697.15	23708.93	0.0	57895.93	7481.21	89.
508	2146	7912.48	8176.03	55007.89	23414.28	0.0	57087.43	7409.12	88.
509	2147	7723.76	8014.65	53893.45	22697.22	0.0	55837.33	7323.90	86.

510	2148	7723.76	8014.65	53893.45	22697.22	0.0	55837.33	7323.90	86.
511	2149	7723.76	8014.65	53893.45	22697.22	0.0	55837.33	7323.90	86.
512	2150	7662.12	7950.16	53463.50	22425.83	0.0	55366.91	7286.82	85.
513	2151	7662.12	7950.16	53463.50	22425.83	0.0	55366.91	7286.82	85.
514	2152	7836.80	8145.98	54778.68	22868.75	0.0	56696.36	7400.92	87.
515	2153	7729.88	8063.77	54251.95	22883.69	0.0	55960.89	7520.78	86.
516	2154	7780.62	8121.96	54663.64	23062.79	0.0	56370.07	7557.86	87.
517	2155	7780.62	8121.96	54663.64	23062.79	0.0	56370.07	7557.86	87.
518	2156	7535.04	7890.94	53050.05	22548.16	0.0	54701.25	7331.39	84.
519	2157	7406.47	7747.47	52013.64	22222.42	0.0	53628.28	7051.10	83.
520	2158	7469.16	7813.12	52413.14	22414.20	0.0	53970.76	7131.41	84.
521	2159	7398.85	7751.20	51986.61	22285.62	0.0	53513.54	7094.33	83.
522	2160	7398.85	7751.20	51986.61	22285.62	0.0	53513.54	7094.33	83.
523	2161	7284.47	7663.92	51377.90	21709.27	0.0	52814.41	7046.19	82.
524	2162	7380.47	7776.44	52043.55	21977.92	0.0	53509.03	7131.53	83.
525	2163	7380.47	7776.44	52043.55	21977.92	0.0	53509.03	7131.53	83.
526	2164	7546.01	7948.11	53172.13	22625.63	0.0	54670.32	7258.32	85.
527	2165	7340.51	7715.40	51698.85	22100.26	0.0	53160.68	6697.76	83.
528	2166	7486.28	7877.71	52784.09	22585.36	0.0	54262.78	6820.18	85.
529	2167	7249.62	7628.80	51119.01	22138.05	0.0	52520.44	6631.42	83.
530	2168	7437.96	7826.81	52436.87	22872.15	0.0	53884.85	6753.19	85.
531	2169	7437.96	7826.81	52436.87	22872.15	0.0	53884.85	6753.19	85.
532	2170	7437.96	7826.81	52436.87	22872.15	0.0	53884.85	6753.19	85.
533	2171	7439.79	7843.69	52529.44	22989.07	0.0	53988.64	6790.27	86.
534	2172	7387.36	7796.32	52176.64	22274.83	0.0	53612.02	6797.07	85.
535	2173	7466.31	7877.38	52730.11	22677.90	0.0	54169.58	6834.15	86.
536	2174	7382.64	7834.82	52411.14	22273.53	0.0	53881.89	6781.35	85.
537	2175	7436.39	7930.31	53018.32	22205.53	0.0	54550.99	6860.01	86.
538	2176	7436.39	7930.31	53018.32	22205.53	0.0	54550.99	6860.01	86.
539	2177	7436.39	7930.31	53018.32	22205.53	0.0	54550.99	6860.01	86.
540	2178	7526.19	8025.04	53631.28	22717.21	0.0	55256.57	6901.47	87.
541	2179	7545.14	8042.33	53759.16	22915.10	0.0	55432.32	7144.68	87.
542	2180	7266.79	7767.95	51860.20	21977.39	0.0	53487.79	6974.12	84.
543	2181	6756.98	7281.28	48477.93	20122.32	0.0	50044.96	6712.33	79.
544	2182	6089.30	6555.50	43511.42	18563.75	0.0	45024.87	6365.89	72.
545	2183	6089.30	6555.50	43511.42	18563.75	0.0	45024.87	6365.89	72.
546	2184	6089.30	6555.50	43511.42	18563.75	0.0	45024.87	6365.89	72.
547	2185	6089.30	6555.50	43511.42	18563.75	0.0	45024.87	6365.89	72.
548	2186	6089.30	6555.50	43511.42	18563.75	0.0	45024.87	6365.89	72.
549	2187	6162.54	6629.09	44012.49	18913.85	0.0	45558.90	6407.35	73.
550	2188	6275.79	6753.88	44840.13	19147.93	0.0	46447.07	6492.69	74.
551	2189	6275.79	6753.88	44840.13	19147.93	0.0	46447.07	6492.69	74.
552	2190	6275.79	6753.88	44840.13	19147.93	0.0	46447.07	6492.69	74.
553	2191	6275.79	6753.88	44840.13	19147.93	0.0	46447.07	6492.69	74.
554	2192	6483.20	7015.19	46615.55	19837.36	0.0	48353.43	6833.49	76.
555	2193	6483.20	7015.19	46615.55	19837.36	0.0	48353.43	6833.49	76.
556	2194	6620.04	7158.70	47580.89	20124.36	0.0	49399.66	6918.83	77.
557	2195	6825.23	7353.04	48895.46	20783.44	0.0	50805.66	7045.63	79.

558	2196	6772.93	7297.18	48514.96	20585.24	0.0	50443.16	7008.55	78.
559	2197	6772.93	7297.18	48514.96	20585.24	0.0	50443.16	7008.55	78.
560	2198	6772.93	7297.18	48514.96	20585.24	0.0	50443.16	7008.55	78.
561	2199	6772.93	7297.18	48514.96	20585.24	0.0	50443.16	7008.55	78.
562	2200	6894.13	7436.60	49497.97	21060.04	0.0	51582.44	6855.05	79.
563	2201	6894.13	7436.60	49497.97	21060.04	0.0	51582.44	6855.05	79.
564	2202	6794.13	7325.31	48744.52	20843.59	0.0	50809.09	6760.68	78.
565	2203	6861.81	7426.49	49450.36	21242.28	0.0	51534.73	6804.44	79.
566	2204	6861.81	7426.49	49450.36	21242.28	0.0	51534.73	6804.44	79.
567	2205	6861.81	7426.49	49450.36	21242.28	0.0	51534.73	6804.44	79.
568	2206	6780.73	7351.15	49353.84	20863.20	0.0	51426.71	6762.98	78.
569	2207	6729.30	7302.70	49012.32	20695.64	0.0	51110.23	6725.90	77.
570	2208	6898.29	7539.23	50582.01	21209.83	0.0	52790.68	6848.32	79.
571	2209	6811.30	7447.98	49954.39	21029.25	0.0	52167.96	6753.94	78.
572	2210	6701.53	7337.22	49206.53	20839.83	0.0	51397.95	6668.60	77.
573	2211	6701.53	7337.22	49206.53	20839.83	0.0	51397.95	6668.60	77.
574	2212	6701.53	7337.22	49206.53	20839.83	0.0	51397.95	6668.60	77.
575	2213	6573.61	7196.19	48275.82	20341.23	0.0	50483.84	6351.23	75.
576	2214	6640.28	7284.31	48877.10	20714.97	0.0	51122.66	6388.31	76.
577	2215	6413.42	7042.35	47229.95	20189.51	0.0	49461.41	6217.63	74.
578	2216	6302.57	6922.13	46419.38	19889.83	0.0	48628.09	6132.29	73.
579	2217	6364.39	7010.31	47043.43	20303.12	0.0	49287.71	6169.37	74.
580	2218	6364.39	7010.31	47043.43	20303.12	0.0	49287.71	6169.37	74.
581	2219	6364.39	7010.31	47043.43	20303.12	0.0	49287.71	6169.37	74.
582	2220	6366.88	7026.27	47160.39	20460.16	0.0	49422.70	6162.69	74.
583	2221	6131.01	6775.77	45457.80	19622.28	0.0	47681.27	5998.82	71.
584	2222	5931.04	6602.86	44318.09	19172.23	0.0	46568.70	5843.05	69.
585	2223	5931.04	6602.86	44318.09	19172.23	0.0	46568.70	5843.05	69.
586	2224	5915.52	6601.05	44304.16	19155.89	0.0	46608.67	5843.04	69.
587	2225	5915.52	6601.05	44304.16	19155.89	0.0	46608.67	5843.04	69.
588	2226	5915.52	6601.05	44304.16	19155.89	0.0	46608.67	5843.04	69.
589	2227	5915.52	6601.05	44304.16	19155.89	0.0	46608.67	5843.04	69.
590	2228	5946.42	6600.45	44299.92	19468.35	0.0	46637.31	5847.42	69.
591	2229	5950.71	6649.25	44397.42	19595.52	0.0	46797.59	5847.42	69.
592	2230	5961.90	6654.39	44411.18	19653.13	0.0	46876.88	5851.80	69.
593	2231	5961.90	6654.39	44411.18	19653.13	0.0	46876.88	5851.80	69.
594	2232	5961.90	6654.39	44411.18	19653.13	0.0	46876.88	5851.80	69.
595	2233	5961.90	6654.39	44411.18	19653.13	0.0	46876.88	5851.80	69.
596	2234	5856.49	6563.30	43793.81	19659.82	0.0	46300.07	5704.50	68.
597	2235	5783.25	6493.59	43330.00	19280.53	0.0	45836.18	5663.04	67.
598	2236	5660.71	6366.94	42489.06	18567.73	0.0	45004.74	5585.15	65.
599	2237	5506.59	6191.45	41276.66	17831.14	0.0	43834.43	5268.43	63.
600	2238	5455.21	6131.03	40870.39	17629.21	0.0	43428.35	5231.35	62.
601	2239	5455.21	6131.03	40870.39	17629.21	0.0	43428.35	5231.35	62.
602	2240	5455.21	6131.03	40870.39	17629.21	0.0	43428.35	5231.35	62.
603	2241	5218.34	5887.35	39275.10	16914.68	0.0	41746.58	5060.67	60.
604	2242	5218.34	5887.35	39275.10	16914.68	0.0	41746.58	5060.67	60.
605	2243	5218.34	5887.35	39275.10	16914.68	0.0	41746.58	5060.67	60.

606	2244	5036.57	5719.13	38133.59	16165.95	0.0	40582.46	4950.63	58.
607	2245	5036.57	5719.13	38133.59	16165.95	0.0	40582.46	4950.63	58.
608	2246	5036.57	5719.13	38133.59	16165.95	0.0	40582.46	4950.63	58.
609	2247	5036.57	5719.13	38133.59	16165.95	0.0	40582.46	4950.63	58.
610	2248	5036.57	5719.13	38133.59	16165.95	0.0	40582.46	4950.63	58.
611	2249	4992.99	5668.15	37791.14	16007.73	0.0	40240.97	4913.55	57.
612	2250	4934.43	5601.59	37358.14	15892.45	0.0	39780.02	4819.17	56.
613	2251	4934.43	5601.59	37358.14	15892.45	0.0	39780.02	4819.17	56.
614	2252	4839.40	5499.37	36669.89	15671.58	0.0	39045.51	4733.83	55.
615	2253	4839.40	5499.37	36669.89	15671.58	0.0	39045.51	4733.83	55.
616	2254	4839.40	5499.37	36669.89	15671.58	0.0	39045.51	4733.83	55.
617	2255	4652.72	5295.50	35326.14	15120.00	0.0	37652.10	4563.15	53.
618	2256	4553.90	5189.13	34625.25	14833.71	0.0	36918.24	4477.82	52.
619	2257	4553.90	5189.13	34625.25	14833.71	0.0	36918.24	4477.82	52.
620	2258	4480.66	5115.54	34124.18	14483.62	0.0	36384.21	4436.36	51.
621	2259	4480.66	5115.54	34124.18	14483.62	0.0	36384.21	4436.36	51.
622	2260	4480.66	5115.54	34124.18	14483.62	0.0	36384.21	4436.36	51.
623	2261	4480.66	5115.54	34124.18	14483.62	0.0	36384.21	4436.36	51.
624	2262	4286.86	4898.94	32754.82	13983.36	0.0	34959.91	4265.68	49.
625	2263	4286.86	4898.94	32754.82	13983.36	0.0	34959.91	4265.68	49.
626	2264	4064.02	4612.95	30862.38	13333.83	0.0	32953.75	4057.93	46.
627	2265	3620.26	4072.50	27261.60	11996.67	0.0	29145.17	3669.73	41.
628	2266	3558.10	4005.22	26803.89	11669.28	0.0	28662.62	3625.97	40.
629	2267	3558.10	4005.22	26803.89	11669.28	0.0	28662.62	3625.97	40.
630	2268	3558.10	4005.22	26803.89	11669.28	0.0	28662.62	3625.97	40.
631	2269	3265.28	3679.49	24525.49	10653.50	0.0	26346.23	3223.27	37.
632	2270	2971.62	3413.05	23046.38	9852.73	0.0	24402.21	2857.64	35.
633	2271	2531.67	2908.70	19716.92	8589.09	0.0	20964.21	2277.57	30.
634	2272	2193.64	2552.19	17252.11	7129.34	0.0	18326.92	2069.93	26.
635	2273	1183.80	1437.70	9544.94	3887.39	0.0	10296.19	1197.71	14.
636	2274	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
637	2275	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
638	2276	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
639	2277	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
640	2278	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
641	2279	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
642	2280	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
643	2281	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
644	2282	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
645	2283	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
646	2284	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
647	2285	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
648	2286	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
649	2287	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
650	2288	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
651	2289	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
652	2290	1158.98	1412.89	9385.28	3849.66	0.0	10128.52	1103.33	13.
653	2291	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.

654	2292	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
655	2293	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
656	2294	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
657	2295	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
658	2296	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
659	2297	938.91	1107.09	7379.99	3362.75	0.0	7959.03	932.65	11.
660	2298	847.48	1037.68	6914.46	2925.43	0.0	7457.11	891.19	10.
661	2299	847.48	1037.68	6914.46	2925.43	0.0	7457.11	891.19	10.
662	2300	847.48	1037.68	6914.46	2925.43	0.0	7457.11	891.19	10.
663	2301	487.24	592.11	3915.73	1592.78	0.0	4245.14	447.02	6.
664	2302	487.24	592.11	3915.73	1592.78	0.0	4245.14	447.02	6.
665	2303	487.24	592.11	3915.73	1592.78	0.0	4245.14	447.02	6.
666	2304	429.74	517.99	3419.08	1265.17	0.0	3700.75	409.94	5.
667	2305	429.74	517.99	3419.08	1265.17	0.0	3700.75	409.94	5.
668	2306	429.74	517.99	3419.08	1265.17	0.0	3700.75	409.94	5.
669	2307	361.25	426.44	2822.16	860.17	0.0	3009.99	368.48	4.
670	2308	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
671	2309	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
672	2310	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
673	2311	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
674	2312	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
675	2313	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
676	2314	280.03	323.68	2140.52	616.21	0.0	2302.85	283.14	3.
677	2315	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
678	2316	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
679	2317	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
680	2318	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
681	2319	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
682	2320	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
683	2321	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
684	2322	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
685	2323	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
686	2324	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
687	2325	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
688	2326	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
689	2327	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
690	2328	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
691	2329	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
692	2330	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
693	2331	178.74	210.70	1386.16	417.72	0.0	1515.26	188.76	2.
694	2332	84.58	95.24	623.25	166.81	0.0	685.63	94.38	1.
695	2333	84.58	95.24	623.25	166.81	0.0	685.63	94.38	1.
696	2334	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.

APPENDIX D

COBB DOUGLAS PREDICTION INTERVAL PROGRAM

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                      C
C     THIS PROGRAM COMPUTES PREDICTION INTERVALS FOR CD MODELS          C
C     ( ENGINE PROGRAM )                                               C
C     ( FOR AIRFRAMES CHANGE READ FORMAT )                             C
C                                                                      C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      IMPLICIT REAL*8(C)
      DIMENSION  X(600,4),XT(4,600),XXI(4,4),L(4),Y(4),M(4),D(600,7),
     1WT(1,4),W(4,1),CXI(4,4),ACOST(600)
C
C     INITIALIZE FLAG TO INDICATE (X'X)-1 IS NEGATIVE
C
      ISIG=0
C
C     INITILAIZE PARAMETERS
C
C     NUM= TOTAL # OF OBSERVATIONS
C     NUM1= OBSERVATIONS THE MODEL WAS ESTIMATED FROM
C     NUM2= OBSERVATIONS PREDICTION INTERVALS TO BE CMPTD ON
C
      NUM=400
      NUM1=300
      NUM2=100
      A=3.046
      B1=.877
      B2=.401
      B3=.032
      S=.035
      T05=1.65
      DO 10 I=1,NUM
      READ(5,900) (D(I,J),J=1,7)
      ACOST(I)=D(I,3)+D(I,4)+D(I,6)
   10 CONTINUE
  900 FORMAT(9X,F7.2,1X,F7.2,1X,F8.2,1X,F8.2,1X,F8.2,1X,F7.2,1X,F4.0)
C                                                                      C
C    THE FORMAT IS    1      2     3     4     5      6   7              C
C                     NORM   DLH   DL$   M$    OVHD$  P$  I              C
C                                                                      C
C
C     CONSTRUCT X MATRIX
```

```
C
      DO 20 I=1,NUM
      X(I,1)=1.0
      X(I,2)=ALOG(D(I,1))
      X(I,3)=ALOG((D(I,3)/D(I,2)))
      X(I,4)=ALOG(D(I,6)/D(I,7))
   20 CONTINUE
      NUMP=NUM1+1
      DC 30 I=NUMP,600
      X(I,1)=0.
      X(I,2)=0.
      X(I,3)=0.
      X(I,4)=0.
   30 CCNTINUE
C
C     OBTAIN X'
C
      CALL GMTRA(X,XT,600,4)
C
C     OBTAIN X'X
C
      CALL GMPRD(XT,X,XXI,4,600,4)
C
C     CBTAIN (X'X)-1 IN DOUBLE PRECISION
C
      DC 32 I=1,4
      DC 31 J=1,4
      CXI(I,J)=DBLE(XXI(I,J))
   31 CONTINUE
   32 CCNTINUE
      CALL DMINV(CXI,4,CT,L,M)
      DO 34 I=1,4
      DC 33 J=1,4
      XXI(I,J)=SNGL(CXI(I,J))
   33 CONTINUE
   34 CONTINUE
      DO 35 I=1,4
      WRITE(6,902)  (XXI(I,J),J=1,4)
   35 CONTINUE
  902 FORMAT(' ',4E20.4)
C
C     CCMPUTE PREDICTED LN(C) IN D(I,7)
C
      DO 40 I=NUMP,NUM
      X(I,1)=1.0
      X(I,2)=ALOG(D(I,1))
      X(I,3)=ALOG((D(I,3)/D(I,2)))
      X(I,4)=ALOG(D(I,6)/D(I,7))
```

```
      D(I,7)=A+B1*X(I,2)+B2*X(I,3)+B3*X(I,4)
   40 CONTINUE
C
C     INITIALIZE COUNT FOR PLOT OF COST VS. TIME
C
      ICCUNT=0
C
C     COMPUTE H
C
      DO 60 I=NUMP,NUM
      DO 56 K=1,4
      Q=0.0
      DO 55 J=1,4
      Q=Q+XXI(J,K)*X(I,J)
   55 CONTINUE
      WT(1,K)=Q
   56 CONTINUE
      V=X(I,1)*WT(1,1)+X(I,2)*WT(1,2)+X(I,3)*WT(1,3)+X(I,4)*WT(1,4)
      IF(V.GE.0.0) GO TO 57
      ISIG=1
      WRITE(6,904) I,V
  904 FORMAT(' ',40X,' V FOR ',I4,'  IS  ',E15.7)
      GO TO 60
C
C     CCMPUTE PREDICTION INTERVAL IN LCG FORM
C
   57 D(I,4)=S*SQRT(1.0+V)*T05
      D(I,1)=D(I,7)-D(I,4)
      D(I,2)=D(I,7)+D(I,4)
      D(I,5)=EXP(D(I,7))
      D(I,7)=ACOST(I)
C
C     COMPUTE UPPER AND LOWER INTERVALS IN DOLLARS
C
      D(I,1)=EXP(D(I,1))
      D(I,2)=EXP(D(I,2))
      X(I,2)=EXP(X(I,2))
      X(I,3)=EXP(X(I,3))
      X(I,4)=EXP(X(I,4))
      D(I,3)=D(I,7)-D(I,1)
      D(I,4)=D(I,2)-D(I,7)
      WRITE(6,901)  D(I,1),D(I,7),D(I,2),D(I,3),D(I,4),X(I,2),I
      IF(D(I,1).GT.D(I,7)) GO TO 59
      IF(D(I,2).LT.D(I,7)) GO TO 59
      GC TO 60
   59 ICOUNT=ICOUNT+1
   60 CCNTINUE
  901 FCRMAT(' ',3E15.5,10X,2E15.5,'  N = ',E10.5,5X,I4)
```

```
C
C     FILL UNUSED VECTORS WITH DUMMY VALUES FOR PLOT SCALING PURPOSES
C
      DC 80 I=1,NUM1
      X(I,2)=1600.
      X(I,3)=6.0
      X(I,4)=46.
      D(I,1)=30000.
      D(I,2)=D(I,1)
      D(I,7)=D(I,1)
      D(I,5)=D(I,1)
   80 CONTINUE
      IF(ISIG.EQ.1) GO TO 90
      WRITE(6,920) NUM2
  920 FORMAT('1',' 90% PREDICTION INTERVALS FOR CCST VS. NORM FOR  ',
     1I4,'  OBSERVATIONS.')
      CALL PLOTP(X(1,2),D(1,2),NUM,1)
      CALL PLCTP(X(1,2),D(1,7),NUM,2)
      CALL PLOTP(X(1,2),D(1,1),NUM,3)
      WRITE(6,921) NUM2
  921 FORMAT('1',' 90% PREDICTION INTERVALS FOR CCST VS. PL FOR  ',I4,
     2' CBSERVATIONS.')
      CALL PLCTP(X(1,3),D(1,2),NUM,1)
      CALL PLOTP(X(1,3),D(1,7),NUM,2)
      CALL PLCTP(X(1,3),D(1,1),NUM,3)
      WRITE(6,922) NUM2
  922 FORMAT('1',' 90% PREDICTION INTERVALS FOR CCST VS. PI FCR  ',I4,
     3'  OBSERVATIONS.')
      CALL PLOTP(X(1,4),D(1,2),NUM,1)
      CALL PLOTP(X(1,4),D(1,7),NUM,2)
      CALL PLCTP(X(1,4),D(1,1),NUM,3)
      WRITE(6,923) NUM2
  923 FCRMAT('1','90% PREDICTION INTERVAL FOR ACT. COST VS. PRED. CCST
     4FCR  ',I4,'  OBSERVATIONS.')
      CALL PLOTP(D(1,5),D(1,2),NUM,1)
      CALL PLCTP(D(1,5),D(1,7),NUM,2)
      CALL PLOTP(D(1,5),D(1,1),NUM,3)
      WRITE(6,924) ICOUNT,NUM2
  924 FORMAT('1',I4,' ACTUAL COSTS OF ',I4,' OBSERVATIONS FELL OUTSIDE
     5THE PRED. INTV.')
   90 STOP
      END
```

APPENDIX E

CES PREDICTION INTERVAL PROGRAM

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C                                                                      C
C     THIS PROGRAM COMPUTES PREDICTION INTERVALS FOR CES MODELS        C
C     ( AIRFRAME PROGRAM )
C     ( FOR ENGINES CHANGE READ FORMAT )                               C
C                                                                      C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      IMPLICIT REAL*8(F)
      DIMENSION X(600,3),XT(600,3),XXI(3,3),L(3),Y(3),M(3),D(600,7),
     1WT(1,3),W(3,1),FXI(3,3),ACOST(600),G(600)
C
C     INITIALIZE FLAG TO INDICATE (X'X)-1 IS NEGATIVE
C
      ISIG=0
C
C     INITIALIZE PARAMETERS
C
C     NUM= TOTAL # OF OBSERVATIONS
C     NUM1= OBSERVATIONS THE MODEL WAS ESTIMATED FROM
C     NUM2= OBSERVATIONS PREDICTION INTERVALS TC BE CMPTD ON
C
      NUM=400
      NUM1=300
      NUM2=100
      BA11=-4.052
      BA12=-.216
      BA21=2.175
      BA22=.87
      BA23=-2.461
      S=.011
      T05=1.65
      DC 10 I=1,NUM
      READ(5,900) (D(I,J),J=1,7)
      ACOST(I)=D(I,3)+D(I,5)+D(I,6)
   10 CCNTINUE
  900 FORMAT(9X,F7.2,1X,F7.2,1X,F8.2,1X,F8.2,9X,F8.2,1X,F7.2,1X,F4.0)
C                                                                      C
C    THE FORMAT IS    1      2    3    4    5      6   7               C
C                     NORM   DLH  DL$  M$   OVHD$  P$  I               C
C                                                                      C
C
```

```
C     CCNSTRUCT X MATRIX
C
      DO 20 I=1,NUM1
      X(I,1)=D(I,1)
      X(I,2)=(D(I,3)/D(I,2))
      X(I,3)=(D(I,6)/D(I,7))
      Z=EXP(BA11+BA12*ALOG(X(I,3)/X(I,2)))
      C1=EXP(BA11/BA12)+Z**((BA12+1.0)/BA12)
      C2=EXP(BA11/BA12)+1.0
      C=ALOG(C1/C2)
      D(I,5)=EXP(BA21)*X(I,1)**BA22*EXP(BA23*C)
      X(I,1)=1.0
      X(I,2)=ALOG(D(I,1))
      X(I,3)=C
   20 CCNTINUE
      NUMP=NUM1+1
      DC 30 I=NUMP,600
      X(I,1)=0.
      X(I,2)=0.
      X(I,3)=0.
   30 CONTINUE
C
C     OBTAIN X'
C
      CALL GMTRA(X,XT,600,3)
C
C     OBTAIN X'X
C
      CALL GMPRD(XT,X,XXI,3,600,3)
C
C     OBTAIN (X'X)-1 IN DOUBLE PRECISION
C
      DC 32 I=1,3
      DO 31 J=1,3
      FXI(I,J)=DBLE(XXI(I,J))
   31 CCNTINUE
   32 CONTINUE
      CALL DMINV(FXI,3,FT,L,M)
      DC 34 I=1,3
      DO 33 J=1,3
      XXI(I,J)=SNGL(FXI(I,J))
   33 CCNTINUE
   34 CCNTINUE
      DC 35 I=1,3
      WRITE(6,902)  (XXI(I,J),J=1,3)
   35 CCNTINUE
  902 FCRMAT(' ',3E20.4)
C
```

```
C         COMPUTE PREDICTED LN(C/PL+PI*Z) IN D(I,5)                      C
C
      DO 40 I=NUMP,NUM
      X(I,1)=D(I,1)
      X(I,2)=(D(I,3)/D(I,2))
      X(I,3)=(D(I,6)/D(I,7))
      Z=EXP(BA11+BA12*ALOG(X(I,3)/X(I,2)))
      C1=EXP(BA11/BA12)+Z**((BA12+1.0)/BA12)
      C2=EXP(BA11/BA12)+1.0
      C=ALOG(C1/C2)
      D(I,5)=EXP(BA21)*X(I,1)**BA22*EXP(BA23*C)
      G(I)=(X(I,2)+X(I,3)*Z)
      D(I,5)=ALOG(D(I,5))
      X(I,1)=1.0
      X(I,2)=ALOG(D(I,1))
      X(I,3)=C
   40 CONTINUE
C
C     INITIALIZE COUNT FOR PLOT OF COST VS. TIME
C
      ICCUNT=0
C
C     CCMPUTE V ( H IN DISCUSSION )
C
      DO 60 I=NUMP,NUM
      DC 56 K=1,3
      Q=0.0
      DC 55 J=1,3
      Q=Q+XXI(J,K)*X(I,J)
   55 CCNTINUE
      WT(1,K)=Q
   56 CCNTINUE
      V=X(I,1)*WT(1,1)+X(I,2)*WT(1,2)+X(I,3)*WT(1,3)
      IF(V.GE.0.0) GO TO 57
      ISIG=1
      WRITE(6,904) I,V
  904 FORMAT(' ',40X,' V FOR ',I4,' IS ',E15.7)
      GC TO 60
C
C     CCMPUTE PREDICTION INTERVAL IN LCG FORM
C
   57 D(I,4)=S*SQRT(1.0+V)*T05
      D(I,1)=D(I,5)-D(I,4)
      D(I,2)=D(I,5)+D(I,4)
      D(I,5)=EXP(D(I,5))*G(I)
      D(I,7)=ACOST(I)
C
C     CCMPUTE UPPER AND LOWER INTERVALS IN DOLLARS
```

```
C
      D(I,1)=EXP(D(I,1))*G(I)
      D(I,2)=EXP(D(I,2))*G(I)
      X(I,2)=EXP(X(I,2))
      X(I,3)=EXP(X(I,3))
      D(I,3)=D(I,7)-D(I,1)
      D(I,4)=D(I,2)-D(I,7)
      WRITE(6,901)  D(I,1),D(I,7),D(I,2),D(I,3),D(I,4),X(I,2),I
      IF(D(I,1).GT.D(I,7)) GO TO 59
      IF(D(I,2).LT.D(I,7)) GO TO 59
      GO TO 60
   59 ICOUNT=ICOUNT+1
   60 CONTINUE
  901 FORMAT(' ',3E15.5,10X,2E15.5,'   N = ',E10.5,5X,I4)
C
C     FILL UNUSED VECTORS WITH DUMMY VALUES FOR PLOT SCALING PURPOSES
C
      DO 80 I=1,NUM1
      X(I,2)=6000.
      X(I,3)=1.1
      D(I,1)=100000.
      D(I,2)=D(I,1)
      D(I,7)=D(I,1)
      D(I,5)=D(I,1)
   80 CONTINUE
      IF(ISIG.EQ.1) GO TO 90
      WRITE(6,920) NUM2
  920 FORMAT('1',' 90% PREDICTION INTERVALS FOR COST VS. NORM FOR  ',
     1I4,'  OBSERVATIONS.')
      CALL PLOTP(X(1,2),D(1,2),NUM,1)
      CALL PLOTP(X(1,2),D(1,7),NUM,2)
      CALL PLOTP(X(1,2),D(1,1),NUM,3)
      WRITE(6,921) NUM2
  921 FORMAT('1',' 90% PREDICTION INTERVALS FOR COST VS. D  FOR  ',I4,
     2' OBSERVATIONS.')
      CALL PLOTP(X(1,3),D(1,2),NUM,1)
      CALL PLOTP(X(1,3),D(1,7),NUM,2)
      CALL PLOTP(X(1,3),D(1,1),NUM,3)
      WRITE(6,923) NUM2
  923 FORMAT('1','90% PREDICTION INTERVAL FOR ACT. COST VS. PRED. COST
     4FOR  ',I4,'  OBSERVATIONS.')
      CALL PLOTP(D(1,5),D(1,2),NUM,1)
      CALL PLOTP(D(1,5),D(1,7),NUM,2)
      CALL PLOTP(D(1,5),D(1,1),NUM,3)
      WRITE(6,924) ICOUNT,NUM2
  924 FORMAT('1',I4,' ACTUAL COSTS OF ',I4,' OBSERVATIONS FELL OUTSIDE
     5THE PRED. INTV.')
   90 STOP
```

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13. ABSTRACT

The objective of this study was to investigate a proposed method of auditing cost-effectiveness analyses of technological changes. The method is based on the use of cost functions to predict costs of operating with and without the improved technology. A comparison of these predicted costs indicates whether the technological change is cost-effective. Results of the comparison can then be used to audit more detailed analyses of the change. The investigation employed econometric techniques in a case study application of the method to a technological change which occurred at the Naval Air Rework Facility, North Island, San Diego, California.

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